

**Czech University of Life Sciences Prague Faculty of
Economics and Management
Department of Management**



Diploma Thesis

Consumer Behavior- Electric Car in India

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CZECH UNIVERSITY OF LIFE SCIENCES PRAGUE

Faculty of Economics and Management

DIPLOMA THESIS ASSIGNMENT

Bc. Maulikkumar Brijenbhai Dave

Economics Policy and Administration
Business Administration

Thesis title

Consumer Behavior – Electric Cars in India

Objectives of thesis

The diploma thesis aims to analyze relevant secondary data on Consumer Behavior and Marketing Management. This analysis will be combined with original primary reconnaissance aiming to provide practical marketing recommendation to a concrete company, leading to performance improvement.

Methodology

“Literature Review” part will be elaborated based on relevant secondary data analysis and synthesis.

“Analysis” part will result from relevant secondary data and original primary reconnaissance combination.

Recommended structure:

1. Introduction
2. Goals and Methodology
3. Literature Review
4. Analysis
5. Results and Discussion
6. Conclusions
7. References
8. Appendices

The proposed extent of the thesis

60-80 pages

Keywords

marketing management, consumer behavior, marketing research, questionnaire, electric car

Recommended information sources

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Declaration

I declare that I have worked on my diploma thesis titled "**Consumer Behavior- Electric Car in India**" by myself and I have used only the sources mentioned at the end of the thesis. As the author of the diploma thesis, I declare that the thesis does not break the copyrights of any other person.

In Prague in February 2021

Maulik B. Dave

Acknowledgement

Any assignment through accomplished individually cannot be completed without the support from various sources who help directly or indirectly towards the fulfilment of the project.

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I would like to extend my gratitude to my classmates and batch mates for their efforts in making me understand and see the different perceptions of the individuals in the society and study how consumers behave.

Thank you all for your patience, understanding and cooperation to help me accomplish this thesis assignment.

Consumer Behavior- Electric Car in India

Abstract

Every day we come across so many topics and articles which states the importance of E- Car and how Government around the world are implementing policies to promote E-Car to reduce the dependences on oil, decrease greenhouse gasses and improve air quality. The Indian Automobile Industry registered a record sale of 24.6% growth in commercial Car, these figures are sufficient to pull our sleeves up and do something about it. A major pollutant comes from Metropolitan cities and hence it is important for people living in these cities to understand and do their bit to reduce the consumption of life-threatening gasses and pollutants. Likewise, given in this context, E-Car promises to extend to be then game changer, but our drawback would be if people do not know about them. This study is aimed to capture the views, sentiments and perception on the awareness and likeliness to buy the Car so that sustainability in environment can be maintained. Data is collected from Car users in India. The study also analyses the awareness levels of customers on government initiatives for E- transportation in India.

Keyword:

Marketing management, consumer behavior, marketing research, questionnaire, electric car, factors analysis

Chování spotřebitelů - Elektrické auto v Indii

Abstraktní

Každý den narazíte na tolik témat a článků, které uvádějí význam elektromobilů a to, jak vláda po celém světě provádí politiky na podporu E-Automobilů, aby se snížila závislost na ropě, snížily se skleníkové plyny a zlepšila kvalita ovzduší. Indický automobilový průmysl zaznamenal rekordní nárůst komerčních automobilů o 24,6%, tato čísla jsou dostatečná k tomu, abychom si vytáhli rukávy a něco s tím udělali. Hlavní znečišťující látka pochází z metropolitních měst, a proto je důležité, aby lidé žijící v těchto městech pochopili a udělali svou část pro snížení spotřeby život ohrožujících plynů a znečišťujících látek. Podobně, vzhledem k této souvislosti, E-Car slibuje, že se rozšíří, aby se pak změnila hra, ale naší nevýhodou by bylo, kdyby o nich lidé nevěděli. Cílem této studie je zachytit názory, pocity a vnímání povědomí a symilitnosti při nákupu automobilů, aby bylo možné zachovat udržitelnost v životním prostředí. Data jsou shromažďována od uživatelů Car v Indii. Studie také analyzuje úroveň povědomí zákazníků o vládních iniciativách pro E-dopravu v Indii.

Klíčové slovo:

Marketing management, chování spotřebitelů, marketingový výzkum, dotazník, elektromobil, analýza faktorů

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1 INTRODUCTION

1.1 Introduction: An electric Car

An electric Car (EV) is a Car that utilizes at least one electric engines or footing engines for drive. An electric Car might be controlled through a gathererframework by power from off-Car sources, or might act naturally contained witha battery, sun-oriented boards, energy components or an electric generator to changefuel over to electricity. EVs incorporate, yet are not restricted to, street and rail Car, surface and submerged vessels, electric airplane, and electric shuttle.

EVs previously appeared during the nineteenth century, when power was among the favored techniques for engine Car's drive, giving a degree of solace and simplicityof activity that could not be accomplished by the gas Car of the time. Present day inside burning motors have been the prevailing impetus technique for engine Car for right around 100 years, however electric force has stayed typical in otherCar types, for example, trains and more modest Car, all things considered.

Ordinarily, the term EV is utilized to allude to an electric Car. In the 21st century, EVs have seen a resurgence because of innovative turns of events, and an expanded spotlight on sustainable power and the possible decrease of transportation's effect on environmental change and other ecological issues. Undertaking Drawdown depicts electric Car as one of the 100 best contemporary answers for tending to environment change.

Government motivations to build reception were first presented in the last part of the 2000s, remembering for the United States and the European Union, prompting a developing business sector for the Car in the 2010s. And expanding buyer premium and mindfulness and underlying motivators, for example, those being incorporated into the green recuperation from the COVID-19 pandemic, is relied on upon to enormously build the electric Car market. A percoid 2019 investigation,projected that Electric Car are relied upon to increment from 2% of worldwide offer in 2016 to 22% in 2030. Much of this market development is normal in businesssectors like North America and Europe; a 2020 writing audit, proposed that development being used of electric Car, particularly electric individual Car,as of now shows up financially far-fetched in creating economies.

2 OBJECTIVES AND METHODOLOGY

2.1 Research Objectives:

Consumer behavior applies to the method and operation of obtaining market knowledge, assessing market options, and purchasing relevant products and services. Consumer behavior analysis assists in the study of consumer desires, the forecasting of customer demands, the development of marketing campaigns that assist in the growth of current customers, the improvement of market share, and the acquisition of a competitive edge. The main objective of this thesis is to Study the factors that influence to customers to purchase electric car in India. The sub goals of this thesis are mentioned as under:

To study the factors that influence customers to Purchase E-Car

To make the analysis of buying behavior of consumers between RegularCar and E-Car.

To conduct descriptive research based on survey to determine consumer preferences in the buying of E-Car.

To evaluate the awareness levels of consumers on E-Car

2.2 Research Methodology:

Research methodology is the set of procedures, strategies as well as method which are used to accumulated data and scribble it down into useful and simple to comprehend information, how the factors affecting to consumer behavior of the E-car industry, the research was completed into main two parts. The first part focusses on the literature review of the preceding research which has been carried out in this subject over the past few years. This data in a systematic way presented under various headings in the literature review section of this thesis. The second part comprises the primary or the empirical research. Which concentrate on the primary or the empirical research, which focuses on the primary data and its assessment and examination quantitatively as appropriate the data was gathered through the questionnaire method. The data shows a simple to understand analysis of a result of the factors on the consumer behavior of the E-car in India. The investigate method can subdivided into three different areas like the exploratory, explanatory, and descriptive research. The make use of the exploratory technique was used in this thesis to get a deep insight into the research question on hand.

Population and Sampling The research objective was to find out how consumers behave in a developing country like India. Identical samples were chosen from the population which reflected the same age, gender, educational level, and occupation. It was ensured that the samples were a correct reflection of the population of India. A questionnaire was devised which focused on questions which elicited the behavior of the consumer. A total of 129 responses were collected each from India.

An identical Google Form was created with questions related to buying behavior of Indian consumer for electric vehicles under the study. Primary data was collected by distribution of this survey questionnaire during the period of January 2020. A comprehensively drafted questionnaire was circulated among friends, neighbors, colleagues and in the community. This questionnaire was made with the help of Google Forms. It was sent to individuals on their mobile phones with the use of social media channels like Facebook and What Sapp. People in different age groups, genders, educational qualifications, and occupations were contacted for this survey to give a good representation of the population. The same procedure was followed in both the countries to make comparison across variables possible.

Figure 2.1 Research methodology

Area and Population	Indian Consumers
Research Area	E-Vehicles
Sample Size	125+ Prospective Customers
Sampling Method	Probability Method of Sampling: Simple Random Sampling
Data Collection	Primary Data Collection: Questionnaire
Research Type	Survey Based Descriptive Research

Hypothesis:

H0: There is no significant difference in consumer behavior in terms of Price while purchasing E-Car compared to Regular Car.

H1: There is significant difference in consumer behavior in terms of Price while purchasing E-Car compared to Regular Car.

H0: There is no significant difference in consumer behavior in terms of various other factors while purchasing E-Car compared to Regular Car.

H1: There is significant difference in consumer behavior in terms of various other factors while purchasing E-Car compared to Regular Car.

3 LITERATURE REVIEW

3.1 Understanding Consumer Behavior:

The study about the people makes decisions about what they need, want, buy, and act regarding a particular product, service or company is known as consumer behavior. Consumer behavior is a vital body of study to help understand how potential customers will react to a new product or service. It is also useful to identify opportunities that are not met. Proactive companies respond to shift in the consumer patterns and wants by studying the behavior of the consumer. They can increase their market share by releasing products in the market which fulfil the demands of the customers.

The concept of consumer behavior started being advocated in literature in the mid-1960s. Consumer behavior is all human behavior - at home, at work, in the shop or even on the street wherever people think about shopping, where they purchase or use the purchased products. (Kaufman, 1995). The American Marketing Association has defined consumer behavior as, “The dynamic interaction of affect and cognition, behavior, and the environment by which human beings conduct the exchange aspects of their lives.”

The reasons why people make certain purchasing decision and consumption decisions are very ambiguous and researchers do not understand these in detail. (Zych 2008: 46; Macijauskas 2010). Consumer behavior studies provide an insight into the methods of making purchases, the reasons behind the choices, the brand loyalty and the brand and price sensitivity, the response to the marketing materials, perceptions of the consumer behavior and finally the acceptance of the offer. (Mokrysz, 2016). The central position of consumers within the activities of a contemporary organisation, an astute and dynamic analysis of their conduct, research, anticipating demand, creating consumer needs and preferences, subordinating the businesses objectives and methods to the demand for a specific consumer segment, the appliance of full quality marketing – these are the conditions for providing contentment to the consumers. (Wróblewski, 2016)

Consumer behavior is very relative and complex to study. It aims to provide a better understanding and forecasting of the subject of the purchases, purchasing motives, and

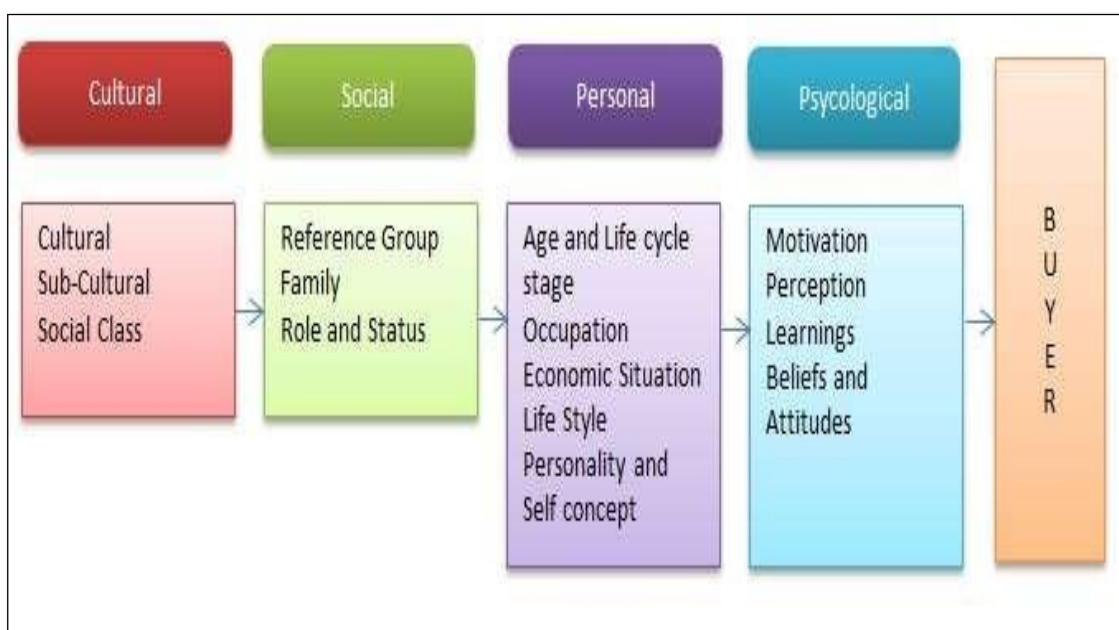
Purchasing frequencies (Schiffman, 2004). There are many new models developed to study the consumer behavior. There are certain internal and external conditions which spur the purchase decision. Usually, the internal factors conceive the need for the product and the external factors help in making the purchase decision. However rational the consumer is sometimes he still displays reckless habits and impulsive behavior which determines his conscious choice (Katona, 1964).

A survey conducted in 2014 on 410 respondents clarified this phenomenon of the complexity of consumer behavior when a huge portion of the respondents mentioned their willingness to purchase a product however only a one third of them purchased. (Maciejewski, 2016). The marketing activities undertaken by a firm along with the cultural environment has an impact on the purchasing decisions. (Wróblewski, 2016).

3.2 Factors Affecting Consumer Behavior:

There are some factors which highly influence the way the consumers behave. They are briefly mentioned below.

Figure 3.1: Factors Affecting Consumer Behavior.



Source: <https://relivingmbadays.wordpress.com/2013/01/25/factors-influencing-consumer-behavior/>

Personal Factors: These are the individual factors which vary from person to person and results in different sets of attitudes and perceptions towards goods and services.

Social Factors: The society in which the consumer lives has a tremendous influence behavior of the consumer. Every consumer behaves in a way which is acceptable to the society.

Economic Factors: The liquidity position and the level of the income of the consumer affects the consumers' behaviors in a huge way. The macro economic factors of inflation, recession, and the business cycles also

Cultural Factors: Culture affects the customs, practices, rituals, and beliefs of the individuals living in an environment. These factors have a major impact on the consumer behavior.

Psychological Factors: The human psyche plays a significant role in the shaping of the likes and the dislikes towards some products and services. These factors are the ones that drive an individual towards satisfaction.

Millions of products are already prevailing in the market. Marketers must fight for the customer's attention, time, and money to make sure that the customer purchases the product of his or her brand. This is a tough task considering today's competitive landscape. Marketers are equipped with a powerful weapon in the form of consumer behavior to make sure that their product or service is picked up from the plethora of available products and services in the market. The study of the consumer behavior answers the five Ws of why, what, when and where related to a product or service purchase. It becomes very crucial for the marketer to study what influences the buying behavior of the consumer and how the marketing messages can be molded to influence the buying behavior in favor of the marketer.

After studying the consumer behavior, the promotion material of advertising, sales promotions, personal selling, public relations, and direct marketing is tailor made according to the behavior of the consumers and keeping in mind his/her likes and dislikes. Each sector of the industry will have different marketing messages which appeal the consumers at various levels. For example, the marketing message of a fast-moving consumer product will be totally different from that of a life insurance product. Whatever the marketing message is, the main aim of it is to convert a want into a sale.

3.3 Importance of Studying Consumer Behavior

The study of the way a consumer behaves towards his thoughts and processes and ultimately his purchase decision is of utmost importance from a marketer's point of view. The following are the main reasons why marketers spend so much amount of money on the analysis of the consumer behavior patterns:

- Helps in increasing the sales of the business - the goal of any business.
- Helps in establishing the selling price of the product.
- Helps in the effective drafting of promotion strategies which push the sales.
- Helps in understanding the competitors.
- Helps in planning and forecasting production.
- Helps in the targeting and segmentation of the market.
- Helps in designing the product portfolio of the business.

“The aim of marketing is to know and understand the customer so well the product or service fits him and sells itself.” (Peter F. Drucker, (1909 - 2005), Author and Teacher)

3.4 Process of Consumer Behavior:

Marketers deploy many models to study the consumer behavior. Since each product or service is unique and each customer is different from the other, it is difficult to pinpoint some specific consumer behavior models. There are numerous models which the markets deploy on what parameter of the consumer behavior they want to study and what end goal they want to achieve. Consumer behavior is a combination of all the above ingredients which is the perfect recipe for a successful conversion to a sale and thus affect the bottom-line of the business. As mentioned above the behavior of the consumer changes with respect to different products and so do the marketing messages to keep alignment with the psyche of the customer

At present, the most accepted is the model of consumer buying decision process, which divides consumer's behavior and decision-making into five subsequent stages (Dibb et al. 1994; Sheth et al. 1999) which is shown in the chart below. The consumer goes through a series of mental stages before a purchase decision is made. The first step commences when there is an identification of a want or need and it culminates in the purchase decision.

3.5 Consumer buying process:

At the most basic level, the model of studying the consumer behavior processes consist of a series of steps which the consumer must undergo to make a purchase. (Kaufman-Scarborough, 2001). The most common five subsequent stages of consumer behavior are as under (Dibb et al. 1994; Sheth et al. 1999):

1. Need Identification: This is the first phase of the consumer buying behavior process in which the consumer feels that there is a gap in his current position and what he needs or desires. Various social, cultural, and psychological factors play an important role in the shaping of this feeling of needing something.

2. Information Search: After the consumer identifies the need, the next is information to search for the product or the service which will help satisfy the need. Internal and external factors help in this. Marketing messages in the form of advertisement play a crucial role in this stage to help consumer know about the product which will satisfy the need.

3. Alternatives Evaluation: The information search gives various brands and products which satisfy the need identified in the first step. Alternatives are prioritized based on the features and other product attributes.

4. Purchase: This is the main stage which is of importance to the marketers as it is here that the exchange happens for a price which the consumer pays for the product that he has chosen. Out of the multiple available alternatives, the consumer has made the choice about the marketer's brand which is a great achievement.

5. Post Purchase Evaluation: During this last stage, the buyer evaluates the product against the benefits that it generates, and this will decide if he will go for future purchase or not. Satisfaction with the product is extremely important for the organization as this will decide repeat purchases from the consumer.

3.6 consumer decision-making process:

Studying the mind of the consumer is a complex phenomenon as there are a multitude of factors which affect the buying decision. Along with the personal variables affecting consumer behavior, there are many socio economic as well as marketing related factors which affect purchases. Consumers sub consciously undergo many stages before making a final purchase. Almost all the models of consumer behavior assume that the consumer is a person who is independent and capable of making his own purchasing decisions, to whom marketers can advertise their business. (Kaufman, 1995). The consumer behavior can be studied through the lens of three phases. (Łodziana-Grabowska, 2015) The first is the input phase where information is fed to the consumer's mind through socio cultural factors and marketing activities. The process phase touches the psychological aspects of the consumer's mind if he or she is not affected by product marketing or the external environment. The last phase which is the output phase relates to the factors which are related to the purchase and the post purchase decisions of the consumer.

In this era of cut-throat competition, the marketing activities of a company has become a key differentiator for success and failure of any organization. The entire buying decision process originates from the perceived needs and buying (economic) possibilities that are to a great extent influenced by the offer (Foret and Procházka, 2006). The offer here means the entire gamut of the marketing mix elements.

3.7 Consumer Behavior and the Marketing Mix

Traditionally the marketing mix elements were limited to product, price, place, and promotions which was proposed by E. Jeromy McCarthy in 1960. Over time the experts in the field felt that more elements need to be added to the mix to provide a fully comprehensive and immersive experience to the consumer. In the context of today, the marketing mix elements consist of the three more elements which were added by Booms and Bitner in 1981 (Professional Academy, 2020) Today the marketing mix of a company looks as follows:

Product: The given product needs to satisfy the needs of the buyer conveniently. The choice of the correct product to fulfil the desire is very important. More information about the product, changing expectations and competition in a product category change the perception of the

consumer regarding the quality of the product (Zeithaml, 1988).

Price: The value of the money the consumers need to shell out for the product with the desired qualities. Consumers evaluate whether they will be able to afford the product at the price point. Purchasing decisions are based on the information indications and signals like the name of the product, the design of the product and the package and the price of the product (Samiee, 1994).

Place: The availability of the right product at the right place is also of utmost importance. The distribution of the product needs to be in such a way that it is available in the remotest part to the remotest buyer. Product distribution is often underestimated in the marketing world (Majumdar, 1996). It is very important to convince the retailer to store the products of the brand and show case them properly to increase the sales. Many companies are in competition to occupy the shelf space of the retailers so that consumers can find the products easily (Katana, 2014).

Promotion: This consists of the way the products are presented and offered to the consumers. Advertising, sales promotions, personal selling, direct marketing are some examples of the promotions which marketers apply to the products. International advertising and international sponsorship of the product has an influence on the way a brand is perceived, and it consequently affects consumer preferences (Qasim and Agarwal, 2015).

3.8 Electric car:

1. A Study on the Adoption of Electric Car in India: The Mediating Role of Attitude (Anil Khurana, V. V. Ravi Kumar, Manish Sidhpuria)

<https://doi.org/10.1177/0972262919875548>

Pollution of the environment is currently a global concern. Toxic emission from internal combustion engines is one of the primary air pollutants. To mitigate the effects of fossil fuel emission and address environmental concerns (ECs), electric Car (EVs) are being promoted aggressively all over the world. Various governments are encouraging people to switch to EVs by incentivizing the transition. Previous studies indicate that the high cost of the electric car, non-availability of charging infrastructure, time, and range anxiety act as impediments to consumer adoption. The Government of India has given a call for 'only Electric Car' on

Road by 2030. This article is contemporary and examines the different factors that affect a consumer's adoption of an EV. The respondents of the study are existing carowners in India. The data were analyzed using Structured Equation Modelling (SEM). Attitude (ATT) emerged as a strong mediator, influencing the adoption of electric Car.

2. Comparison of Electric and Conventional Car in Indian Market: Total Cost of Ownership, Consumer Preference and Best Segment for Electric Car Akshat Bansal¹, Akriti Agarwal² 1, 2 Student of MBA (Technology Management), SVKM's NMIMS, Mukesh Patel School of Technology Management and Engineering, Mumbai, India

This research covers the area of electric Car stance for personal Car and its relevant market including the background information about the topic. The research is focusing on the research of current situation for the buyers and the less and more favorable conditions in Indian automobile industry. The principal of the report is a comparative research of electric Car and conventional Car. In addition to this, the research focuses on the total cost of ownership of owning Electric Car instead of the conventional Car in the Indian market. The research also emphasizes on manufacturer perspective by finding out the best segment to launch an electric Car in India. In addition, the research assumptions are used in the formation of a questionnaire focusing on finding out about the awareness of electric Car among the publicity nowadays. The final statement that is going to be approved or rejected is the electric Car as a better alternative to the conventional Car in India.

3. Electric Car in India: A Novel Approach to Scale Electrification Publisher: IEEE

Ashok Jhunjhunwala; Prabhjot Kaur; Sushant Mutagekar

Over the last few years, electric Car (EVs) have captured the imagination of people in many parts of the world. Approximately 1.1 million passenger EVs (Car) were sold in 2017, up by about 57% from the previous years. China contributed 600,000 Car, the United States had 200,000 and Europe 125,000. EV sales in Norway constituted 50% of all Car sales. Several nations have announced that their Car will be fully electric by 2025, 2030, or 2040. General Motors, Ford, Toyota, Volkswagen, and others demonstrated their EV ambitions by making major EV announcements, while Chinese automakers like BAIC and Changan announced

they will sell only EVs after 2025. According to Bloomberg, the global EV sales will grow by 40% in 2018. U.S. sales are expected to exceed 300,000 units, and European sales should reach around 400,000, with Germany as the leader. China will lead the way in four-wheeled Car as well as electric bus sales. Beijing has committed to completely switch over its taxi fleet of around 70,000 Car by 2020. Moreover, by the end of 2018, charging infrastructure is expected to constitute almost 700,000 stations.

3. Electric Car in India: current trends and future forecasts *by Vishal Shukla*

As globalization is increasing, so is the demand for oil-based energy, which is ultimately resulting in the rapid fluctuation of the market prices of the crude oil due to the basic principle of economics Law of Demand. This volatility and uncertainty in crude oil's demand and prices create pressure on governments and policymakers to look at new alternatives, one of them being the adaptation of green technologies. Green alternatives seem to be the trend of the future business and markets. Many business giants are compelled to spend heavily on their R & D and come up with innovative technologies focusing mainly on green technologies. In line with the developed countries, India, as a developing economy, is all set to plunge into this new innovative market of Electric Car (EVs) and aims to become a major producer of the EVs for the Indian market as well as the globally. So, this research article aims to explore the expected demand for EVs, the market share, and the contribution of the EVs and associated technologies to foreign trade.

5. Control and optimization of a dual-motor coupling drive system of pure electric Car based on multi-island genetic algorithm.

by Qingyong Zhang, Yongjun Luo, Weiping Lin, Yaru Wang, Xingjian Wu

To improve the endurance of pure electric Car, improving the energy use is an effective way to increase the mileage. Energy use can be effectively improved by using the new structure of dual motor coupling drive system as the power source. The new structure improves energy use through eight mode switching. In this paper, CRUISE is used to build the Car model of a pure electric Car, and its control strategy is established by Simulink. The reliability of the model and control strategy is verified by using CRUISE and Simulink joint simulation

method, and the parameters in the control strategy are optimized by the multi-island genetic algorithm. To provide a scheme for the research of improving the energy use rate of the pure electric Car.

6. Addressing the challenges to electric Car adoption via sharing economy: an Indian perspective Rupesh Kumar, Ajay Jha, Akhil Damodaran, Deepak Bangwal, Ashish Dwivedi Management of Environmental Quality ISSN: 1477-7835 Publication date: 6 August 2020

Purpose

The purpose of this study is to investigate the challenges before India for electric Car (EV) adoption by 2030. The study further investigates the measures taken by the Government of India (GOI) to promote research and development in EV sector and what is yet to be done.

Design/methodology/approach

In the present study, the challenges are identified allied to the commercialization of EVs in India. The data are collected, analyzed, and compiled through secondary sources. The secondary data give a concise insight and comprehensive information regarding what is occurring around the globe as well as in the Indian context. Further, the challenges are investigated through a focus group study consisting of 11 participants from industry and academia.

Findings

The findings from the study are the critical roles of sharing economy and public utilities in the promotion of EV adoption, given the high cost of EV, lack of infrastructure and poor purchasing power of Indian customers. The sharing economy perspective provides various opportunities for the government to manage the resources (electric-powered transport system) optimally. Further, the study compares the global perspective in assigning the target figures.

Research limitations/implications

The study highlights the facilitating role of the shared format in EV technology promotion but ignores the hurdles that can come in its implementations. Also, the focus group study has its limitation as it relies more on participants' perceptions and opinions.

Originality/value

The present study assists GOI and various stakeholders in having a realistic plan rather than daydreaming with overambitious goals. The diffusion of technology as a shared format (especially in the context of EV) has not been academically approached in the past literature.

7. Analyzing vibration environment of a power battery in a running electric Car *by Ruixue Liu, Zhichao Hou, Shuyu Wang, Deke Sheng*

Power batteries in electric Car are subjected to vibration during the Car driving. The vibration environment may affect battery performance by connection failure and capacity degradation. Thus, clarifying battery vibration characteristics when a Car is driven on real roads is the basis for understanding battery performance in their service conditions and for structure improvement. The acceleration responses at multiple points on the bottom of a power battery are measured when a commercial electric Car is driven on various road types (including typical city road and some reinforced road conditions) in this study to better understand the vibration levels at different positions of the battery during Car driving. Indicators, namely the standard deviation of the acceleration root-mean square (SD-ARMS) and fatigue damage spectrum (FDS), are introduced to analyze vibration differences among various measured positions and with vibration test standards. The FDS is calculated by combining various road types in a certain proportion according to Chinese road conditions, representing 600,000 km of driving, the compulsory scrappage driving distance in China. Time-forced vibration test profiles are derived based on the calculated maximum and minimum FDS curves. The measured results indicate inconsistency in vibration levels among the sampling points, especially in the Z direction. The standard deviation of the multipoint ARMS is approximately 40% of its mean value. Additionally, the vibration levels in the three directions are obviously discrepant. The fatigue damage values computed from the measured vibration signals and from standard vibration profiles significantly deviate. The research in this paper is the first to reveal practical vibration inconsistency of battery cells at different positions in a battery pack, and provides a method to evaluate vibration level, and to generate vibration profiles for durability assessment of batteries in a laboratorial

vibration environment.

8. Electric Car transmission types and setups: a general review by *Dimitrios Rimpas, Pavlos Halkiadakis*

Over the last decade, electric Car (EV) have changed the global automobile industry driven by the progress of electronics and powertrain systems. New controllers are manufactured, and research has been made not only on motors but on transmissions as well. This paper focuses on describing the types of gearboxes available - continuous variable, automatic, manual - with their pros and cons and the experiments done with different gearsets (plan and gear numbers) single or multiyear transmissions on urban or highway cycles to maximize energy efficiency. Gearshift strategies are also a big area of interest alongside simulations testing various gear ratios handled by complex controllers and control algorithms to ensure smooth driving and performance with minimal to low jerk and torque interruption. The aim of this paper is to completely report the work done on transmission software and hardware improvements and on the top of the shelf technology that the current EVs implement.

9. Design and testing of a supercapacitor storage system for the flash recharge of electric buses by *Luca Pugi, Adriano Alessandrini, Riccardo Barbieri, Lorenzo Berzi, Marco Pierini, Fabio Cignini, Antonino Genovese, Fernando Ortenzi*

This work proposes a hybrid storage for urban transport systems to reduce recharge time and increase its life and reliability. The proposed system is applied to a pre-existing electrical Car introducing through proposed revamping procedure also a methodology for a fast integration of the proposed system on different Car. Finally, the system is calibrated and tested showing how the proposed control layout really simplifies Car's commissioning.

10 Advancements in power conditioning units for electric Car applications: a review by *Rabindranath Tagore Yadlapalli, Anuradha Kotapati, Rajani Kandipati*

Fuel cells are renowned for their direct energy conversion, quiet operation, fuel flexibility and zero CO₂ emissions. However, each fuel cell produces a very low output voltage of around 0.5 V to 0.7 V. Therefore, it is essential to design high voltage gain DC-DC converters for boosting such low voltages either from a single fuel cell or fuel cell stack, besides minimizing the current ripples. Furthermore, DC-AC converters are required to produce an AC output voltage for either the single-phase or the three-phase utility loads.

This paper presents a review on various prominent DC-DC and DC-AC converter topologies. The performance of various DC-DC converter topologies is analyzed in terms of number of components, converter switching frequency, galvanic isolation, power rating and efficiency. This paper emphasizes the use of ultra- and super-capacitors for meeting the load dynamics as well as elimination of second harmonic currents. The salient features of potential DC-AC converters with low total harmonic distortion and high efficiency are presented. This paper is very useful for researchers and design engineers for choosing the right topology.

11. Low impact Car's battery supply chains: assessing the impacts of alternative procurement strategies by *Carlo Rafele, Claudio Gallo, Giulio Mangano, Anna Corinna Cagliano, Antonio Carlin*

This work aims at supporting decision-making related to make or buy strategies for procuring batteries assembled on electric and hybrid Car for a car manufacturer that is introducing new models in its portfolio. Several supply chain scenarios have been defined according to the battery architecture. The results show that the purchase of complete. This work aims at supporting decision-making related to make or buy strategies for procuring batteries assembled on electric and hybrid Car for a car manufacturer that is introducing new models in its portfolio. Several supply chain scenarios have been defined according to the battery architecture. The results show that the purchase of complete batteries implies the highest costs and CO₂ emissions. On the contrary, buying single components helps to improve these aspects, but it requires a certain level of vertical integration by the car manufacturer together with specific knowhow. Finally, purchasing modules result in the lowest costs owing to a reduced number of trips due to the product structure. Thus, this paper proposes a framework to guide automotive companies in effectively designing make or buy strategies in their battery supply chain by comparing alternative vertical integration levels.

12. Hybrid Car: past, present, and future by *Saurav Kumar Singh, Bhavesh Kumar, Namrata Nanda*

With constant load, the internal burning engine (and any added heat engine) works finest. If the engine can continuously work close to its optimum operating point, there will be a dramatic increase in efficiency and longevity, a reduction in complexity and costs, and a much relaxed and cheaper control of emissions. But electrical drive is great for variable loads. Competence remains high, extreme rotation is available even at low power output, and

under braking electrical energy can be recovered resourcefully from mechanical energy. To fully capitalize on these fundamental characteristics, hybrid driven trains aim to combine the internal combustion engine and the electric motor in a synergistic manner. Although there has been hybrid drive for more than twenty years, there is much scope for further enhancement. Continuous price decrease in electrical components bringing power to the axle and technology used for battery with further enhancement of internal combustion engines planned specifically for hybrid driving can lower costs and increase efficiency, by offering enhanced driving experience. Although we have a lot of cheap oil, it is the need of the hour to move to more sustainable sources eventually. Over the coming decades, CO₂ emissions from oil combustion have become an important economic as well as moral consideration.

13. Research on energy management of hybrid power system in fuel cell Car

by Meilan Zhou, Weijie Liu, Yu Zhang, Jiaming Wang

To solve the problems of short service life of batteries and soft output characteristics of fuel cells, we study the hybrid power system composed of fuel cell (FC), battery and unidirectional DC/DC converter. To achieve a reasonable energy distribution and reduce the hydrogen consumption of the fuel cell, we propose an optimized control strategy based on the Pontryagin's Minimum Principle (PMP). The optimized control strategy uses the output power of the fuel cell (P_{fc}) as the control variable, the state of charge (SOC) of the battery as the state variable, and the hydrogen consumption of the fuel cell as the performance index. We also propose a fuzzy optimal control strategy based on fuzzy control. This is optimized by changing the parameters in the membership function with the Teaching Learning-Based Optimization (TLBO). Based on the simulation software, we build simulation model to realize the real-time simulation of the two control strategies. The simulation results show that compared with fuel cell power alone, the hydrogen consumption is reduced by 10.1% when using the fuzzy optimization control strategy, and the hydrogen consumption is reduced by 12.7% when using the optimal control strategy based on PMP.

14. An overview on hybrid energy storage systems for electric Car by *Rahul Charles C M, J.S. Savier*

Since battery electric Car (BEVs), hybrid electric Car (HEVs) and plug-in hybrid electric Car (PHEVs) are coming onto the market in great numbers, the search for better energy storage technologies with enhanced energy density, power density, durability, safety, and affordability is gaining importance. The ineffectiveness of the standalone battery system during peak demand situations and variations in transient load conditions leads to its reduced recognition. Since more power requirement is demanded by such situations, batteries in turn tend to be oversized to meet desired results, which in turn leads to increased volume, weight, and rate. Depending on battery alone can lead to lower efficiency since the increased stress leads to low performance of battery and decreased lifetime. A lot of research works are going on to choose suitable storage technologies that provide diverging degrees of promise in performance and capability to cope with the market requirements for electric Car. This paper sheds light on the major hurdles that cause a decreased popularity of standalone battery system. Different HESS designs based on qualitative comparisons are discussed.

15. Modelling of electric Car drive toward its range prediction and remaining battery. SOC after trip completion by *Sutapa Mondal, Arup Nandi, Mousumi Khanra*

Modelling of electric Car (EV) drive is important to predict its range and remaining battery SOC after trip completion in any route. That information is extremely necessary for a driver beforehand to deploy an EV for performing a trip. Conventional models or manufacturers suggest EV range in a straightforward method without considering many aspects, such as route information, traffic norms, driving behaviour and external disturbances, but those aspects influence the actual range achieved. This paper presents an EV drive model for a micro-trip which includes all possible aspects along with the regenerative braking for a (pure) electric Car. The driver's primary inputs to the model are the Car initial speed, initial battery SOC, driving strategy to be followed and remaining distance of the route to be covered. Data related to the corresponding route are collected and fed to the model as secondary inputs. The model is validated by comparing the simulated data with that of experimental values of a commercial EV and analyzing the variations of critical parameters of EV components. The importance of the EV drive model is established by analyzing the effects of route parameters and driving behavior on EV range.

16. Multi-objective optimal driving strategies for hybrid electric motorcycles with parallel configuration by *Jhon Vargas, Gilberto Osorio-Gómez, Tatiana Manrique*

This paper discusses the problem of determining optimal driving strategies for a 125cc street-type motorcycle with a parallel hybrid configuration. A brief literature review of different types of hybrid motorcycle and energy management strategy indicates that there is a research gap for control and driving strategies for street-type motorcycles. Then, typical characteristics of hybrid parallel architecture are analyzed to formulate different optimal performance indices, and to propose a dynamic model of a parallel hybrid electric motorcycle. The optimal performance indices are formulated as three different driving strategies, or operation modes, stated as long range, sport and normal. Each strategy is detailed with its corresponding performance functions and costs, based in the state space vector defined for the dynamic model.

17.Design of battery management system based on improved ampere-hour integration method *by Mingyue Zhang, Xiaobin Fan*

With the emergence of the energy crisis and environmental pollution problems, electric Car are paid more attention. As an important core component of electric Car, the battery management system (BMS) has also become a hot issue in current research. The research of BMS is mainly focused on the state of charge (SOC)estimation and equalization methods. This paper designs a complete BMS, includingthe design of its software and hardware. The BMS uses the AT89C52 as the master chip and the DS2438 as the sampling chip. At the same time, the improved ampere- hour (Ah) integration estimation method, based on the open-circuit voltage (OCV) estimation method, is used to estimate the SOC. In addition, the BMS uses relays to control switched capacitors to realize the equalization. Finally, comparing the resultsof the experimental group with the simulation group, we found that the sampling precision of the BMSs voltage, current and temperature is 0.4%, 0.5% and 0.5% respectively. Also, the equalization time of the BMS is less than 250 seconds.

18.Exploring the key buying factors for electric scooters *by David Vallejo-Morales, Elena Higuera-Castillo, Francisco Liébana-Cabanillas*

Governments actions to protect the environment, along with firm's commitment to green corporate social responsibility, facilitate the emergence of new technologies, products, and business models. Sales of electric Car and e-scooters are growing, including an increased use of e-scooter sharing services. This study analyses the intention to use electric. scooters through an online survey. Based on the technological acceptance model and theory of reasoned action, a set of variables has been incorporated to explore the full context of this innovative technology. The research hypotheses are contrasted through PLS-SEM. The results of the analysis reveal perceived value, security and technophilic as the main determinants of intention to use e-scooters. A series of managerial implications are also discussed.

19. Learning from two meta-technologies the grown (plastics) and the growing (EV batteries): evolution, potential challenges, and considerations to manage *by Maruti Khaire.*

One of the most significant inventions that has touched the day-to-day life of common people of our time is plastic material. The material is light in weight, corrosion resistant, weatherproof, easy to manufacture, highly adaptable to its end use with the help of suitable additives and, most importantly, most affordable. However, despite having so many advantages, its major disadvantage is that it is difficult to dispose of and takes a very long time to decompose. The chemicals added to plastic material to improve its properties are toxic in nature, making it an environmentally non-friendly material. The disposal of plastic material is one of the major challenges the world is facing. Landfills, waterway clogging, adverse effect on biodiversity and severe impact on ocean life are just a few of the challenges, besides the impact on greenhouse gases. In recent times, battery electric Car (BEVs) have become a growth technology, and almost all the major automotive manufacturers are producing electric Car. BEVs have advantages such as very low operating cost, no emission during the Car operation and enhanced Car maintainability owing to the lower number of rotating parts compared with ICE Car. However, BEVs have inherent shortcomings, i.e., their batteries have a comparatively short life, and their performance degrades over time. This makes EV batteries prone to present disposal challenges in future like those of plastics. If recycling of battery material is prolonged further, it will present the same challenge as plastic material. This paper is focused on the similarities and differences between plastics and BEV batteries, which seem to have the potential to generate similar challenges in future. However, considering the nature of EV battery technology and focusing on battery material recycling, this paper also suggests a direction of technologies to take advantage of EV technologies. Avoid, minimize, reuse, circular economy, and disposal in landfill are some of the technology directions or considerations to be given in future battery technology development. The focus of this paper is to learn from the plastic evolution and to use this learning to plan for EV battery technology development and adoption.

20. Supply chain barriers for electric Car and their mitigation strategies: a systematic literature review by Atul Pandey, Tanuj Nandan

Climate change is a global concern. The contribution of the transportation sector to the emission of greenhouse gases is significant. This can be reduced to a large extent by the adoption of electric Car. Many barriers affect the adoption and manufacturing of electric Car. This study identifies these challenges from a systematic literature review. Demand side challenges include high price, lack of charging infrastructure, range anxiety, consumer awareness, etc. Supply-side challenges include the high cost of components, technology development issues, massive capital investments, etc. Investments in charging infrastructure, research and development, consumer awareness, and government incentives are identified as mitigation strategies to overcome these challenges.

21. Factors influencing the adoption of electric Car in India: an empirical analysis by Rajeev Goswami.

The adoption of electric Car (EV) has potential to address greenhouse gas emissions, energy dependency and resource scarcity. The Indian government has implemented policies and incentives to foster EV adoption. Considering the Indian scenario, an EV purchasing model is proposed that comprises various demographic and behavioral factors. A survey was conducted in six cities of India (Delhi, Bengaluru, Mumbai, Nagpur, Kolkata, and Dehradun). By using logistic regression (LR) methods and three- way contingency chi square, a novel EV purchasing model is proposed. The LR method reveals that several behavioral factors such as age, environmental consciousness, price, brand, performance, etc., impact the willingness of consumers to adopt EV. With chi- square statistics, the demographic factors such as education level and marital status influence the EV buying behavior. These factors may facilitate the government to frame more efficacious policies and assist the industry actors in designing diverse marketing and sales strategies to increase the adoption rate of EV.

22. Transient power smoothing control strategy for the battery of a pure electric bus by Meilan Zhou, Weijie Liu, Yu Zhang, Jun Fu

Aiming at the problems of unreasonable power distribution of composite energy storage system and battery transient power smoothing in a pure electric bus, this paper designs a

fuzzy control strategy and a wavelet transform control strategy. We select the condition of Chinese city buses and Harbin urban road condition as the simulation condition and carry out the joint simulation through the DLL file and the Car simulation software. We obtain the power curves of the battery and ultracapacitor and the system energy flow graph under the two control strategies when running different cycle conditions. The simulation results show that the two control strategies are effective in smoothing the battery transient power. Compared with the fuzzy control strategy, the wavelet transform control strategy makes the battery output power frequency lower, thereby extending the service life of the battery. To further verify the effectiveness of the control strategy, we establish an experimental platform for a pure electric bus drive system. The experiment results show that the proposed two control strategies have a significant effect in smoothing the transient power of the battery and improving the energy use rate.

23. Decision making in community patrols concerning the use of electric and hybrid plug-in Car *by João Santos, Vitor Moutinho*

Sustainability and less carbon emission are now two of the most common goals for and from countries, enterprises, and regular citizens. In this study, we used the information from an already applied questionnaire to assess the perception from the leading structure of the Portuguese Military Police (GNR) concerning the shift to electric and hybrid-electric Car. For empirical analysis to evaluate the community patrol point of view, we employ the ordered logistic regression. When the findings of the estimations in both models are applied, it is possible to state that the move to electric Car is considered a command improvement, that is quite possible to use electric Car as police Car, especially, but not only, for community patrol.

24. Design and implementation of software and hardware of battery management system based on a novel state of charge estimation method *by Mingyue Zhang, Xiaobin Fan*

As the main energy source of new energy Car, power batteries have always been the focus of attention. Also, the battery management system (BMS) is paid more attention, whose research focuses on the collection of the status and state of charge (SOC) estimation of the battery. A BMS is developed in this paper, which is mainly composed of the battery pack, the lower computer, and the upper computer. The lower computer is responsible for the real-

time detection of the battery pack status (voltage, current, temperature, and state of charge) and the communication with the upper computer. The upper computer is responsible for real-time display of the battery pack status and control of the charge and discharge mode. In terms of SOC estimation, the lower computer uses an improved ampere-hour (Ah) integral algorithm, which considers factors such as charge and discharge efficiency, temperature, and ageing factor; the upper computer uses a new Extended Kalman Filter (EKF) algorithm based on the improved Ah integral algorithm. The model of the new EKF algorithm is the Dual Polarization (DP) model of the battery pack average model, and its parameters are obtained by offline identification according to the data from the hybrid pulse power characterization test. From the results of the 1C constant current discharge experiment, the SOC estimation results of the upper computer and the lower computer have very good accuracy, especially the improved EKF in the upper computer can better estimate the SOC value and track the change of the terminal voltage.

25. Electric Car charging methods and impact of charging and discharging on distribution system: a review by *Lakendra Kumar, Ravi Lathwal*

Nowadays, electric Car have got more attention from customers owing to a lot of benefits, both atmospheric and economic. Electric Car are an emerging tool for reducing greenhouse gas emissions and air pollution and providing clean transport systems. Electric Car have limited energy for drive as they require recharging of battery. This paper provides a review on recently used charging methods and charging strategy. Owing to the increasing load of electric Car charging on the distribution system, we also provide a detailed review of the impact of charging on the distribution system in terms of negative and positive impacts. This paper also investigates the impact of the Car to grid scheme. Finally, some research challenges and objectives are indicated.

26. Automatic discovery and selection of most qualified electric Car charging station by *Raziq Yaqub, Kaveh Heidary*

Media reports show that electric Car (EVs) still outnumber public charging stations by more than six to one, which is consistent with the early stage of electric car deployment. Thus, finding charging stations may be a daunting task for EV drivers. Though the issue can be

dealt with by providing online directories, web-based charging station locators, global positioning system (GPS) assisted gears, however, these methods are not adequate, because they do not help EV drivers automatically discover and select the most qualified EV charging station. Thus, it will be frustrating for a driver to reach a certain location, or multiple locations, and not find a service because of grid inadequacy, long waiting queue, neighborhood safety, or the value he was looking for. This paper introduces a method and apparatus based on which the smart client installed in EV would automatically discover, shortlist, and select, or to recommend the EV driver, the most qualified EV charging station.

27. Status of electric Car in India: an overview by VikasKhare, Cheshta Khare, Savita Nema, Prashant Baredar

In the present scenario, the best use of new technology makes it necessary to increase its use in the transportation sector. Electric Car and hybrid plugin electric Car are a very good option to replace conventional gasoline and diesel operated Car. Developed and developing countries such as China and Germany are working prominently in this area and have created a lot of infrastructure for the enhancement of the market for these Car. In India, there is extensive growth in the two-, three- and four-wheeler electric Car. This paper presents the current infrastructure of electric Car in the country and addresses the state-wise numbers of electric Car registered in the last 5 to 10 years. Further, Indian government policy towards green Car and an ecosystem of electric Car in terms of market, technical and infrastructure is also presented. The paper analyses the pros and cons of electric Car from an environmental point of view, where some hurdles are also occurring due to the electric Car infrastructure. Assessment of charging framework in the India and the grid parity of an electric Car are the key points addressed in this paper. Finally, a solar-powered charging infrastructure is suggested to mitigate the environmental issues and the Master Operation Scheduling (MOS) of electric Car's transportation in India is discussed.

28. Technological developments in batteries: a survey of modelling, estimation, and management strategies for electric Car applications by Gaddipati Geetha Ravali, Kuthuri Narasimha Raju

Battery technology is extensively used as an energy storage system in electric Car (EVs). Although large-scale battery energy storage systems are commercially available in the market, such as Pb-acid, NiCad, and Li-ion batteries, the major hurdles are longevity, reliability, cost savings, and safety. Nonetheless, owing to technological advancement, more research and development are progressing towards the future battery chemistries, such as metal-air and flow batteries. This study aims to explore and compare the features of various battery technologies. Besides, the prerequisite condition for efficient battery operation is its accurate cell model. The popularly used battery models for electric Car are summarized. Emphasis is given on battery models concerning hysteresis effect, capacity degradation, and thermal behavior to characterize the real- world performance by incorporating several factors into mathematical equations. Moreover, the successful operation of EVs depends on accurate state of charge (SOC) estimation, which is a challenging task to be performed by an effective battery management system. This paper presents the performance of various SOC estimation techniques by considering the major nonlinearities, such as capacity degradation, ambient temperature, and many unknown errors. Thus, the analysis emphasizes many key issues, challenges, and recommendations for developments in SOC estimation and enhancement of battery management systems for future EVs.

29. Technical analysis for implementing BS-VI automotive emissions norms with respect to electric Car production by 2020 in India by Devendra Vashist, Farhan Mukhtar

Automotive pollutants include CO, NO_x, HC, PM (mostly soot) & Sox. India has decided to implement BS-VI norms by April 2020. Auto sector is also likely to switch towards electric mobility. In this research a comparative study in terms of financial and social- economic is made between challenges to be faced by auto sector shifting toward electric mobility and making BS VI compliant Car. For the analysis, the e2o Plus of Mahindra & Mahindra and the Alto 800 LXI of Maruti Suzuki which are similar in size and volume but powered by two different sources were chosen. It was observed that shorter mileage, frequent battery

recharging, frequent maintenance and least charging infrastructure are areas which must be addressed by auto industry for commercial viability. Lithium-ion battery is least suitable and sodium ion battery is under research trials. This research recommends a hybrid model to be adopted before switching to electric mobility.

30. Analysis of performance improvement in energy storage system for electric Car: a review by V.M. Dileepan, J. Jayakumar

The selection of energy storage system is very crucial for electric Car. It should have good energy density; considerable power density and it must be light weight. So, a battery with considerably high energy density must be used in electric Car. Lithium-ion batteries are very much preferred as electric Car's batteries. They have high energy density, high life cycle and smooth operation. But the problem related with lithium batteries is they have high temperature sensitivity, and their operation will be affected by over current charging and over current discharging beyond their maximum rated values and influenced by driving conditions and performance of motors used. So, battery management, control and optimization system are essential in electric Car's energy storage battery packs. This paper is a review of the design of a novel battery management and control system for lithium-ion batteries for performance improvement in electric Car.

31. Analysis of effective discontinuous decoupled PWMS for a four-level open end winding induction motor drive through stator flux ripple by Kalyan Kumar Koppolu, K. Anuradha, M. Surya Kalvathi

Dual inverter fed open-end 3ϕ induction motor drive (OEW-IMD) with different dc-link voltages can perform four-level (4L) realization. Now the earlier scheme operates with high conduction losses and dv/dt at voltage symmetries that effects overall efficiency. This paper proposes the effective discontinuous decoupled SVPWM (EDDPWM) scheme, which deals the DD-PWM with a concept of effective time employment to high voltage side inverter and low voltage side inverter independently that are labelled as EDDPWM-1 and EDDPWM-2, respectively. A factor variable k relating to active time of vectors application is presented. For k is varied from 10% to 100% of individual inverters that effects both individual and net inverter voltage vectors of a dual inverter. Therefore, the effect of factor k on ripple content,

harmonic spectra of motor currents for insight of torque ripple, and different characteristics are analyzed. These proposed methods achieved flexible performance enhancement compared to previous methods.

32. Electric Car: A Synthesis of the Current Literature with a Focus on Economic and Environmental Viability: Marcello Contestable, Dr Gregory Offer, Dr Robin North

A research concludes that the longer-term uptake of EVs will depend heavily on progress in battery technology, to bring down costs and increase energy density, and on the provision of a suitable recharging infrastructure. (Marcello Contestable, 2012)

33. Potential Need for Electric Car, Charging Station Infrastructure, and its Challenges for the Indian Market: by Praveen Kumar and Kalyan Dash

India should invest in small scale reinforcements to manage the load issues locally rather than going for an enormous change. Home charging should be encouraged. Proper planning of place, population, traffic density and safety should be considered before

implementing the massive scale charging infrastructure. The integration of activities within the energy and transport fields is important. Development goals through different innovative policies and programs, for instance, drivers of electrical Car are offered a financial consumer incentive, like tax credits, purchase subsidies, discounted tolls, free parking, and access to restricted highway lanes will help the market to grow. (Dash P. K., 2013)

34. Conventional, Hybrid, or Electric Car: Which Technology for an Urban Distribution Centre? by Philippe Lebeau, Cedric De Cauwer, Joeri Van Mierlo, Cathy Macharis,

Freight transport has a major impact on urban movement. Researcher explored the possible integration of electric Car in urban logistics operations. A fleet with different technologies has the opportunity of reducing the costs of the last mile. Researcher presented a fleet size and mix Car's routing problem with time windows for EVs. The main contribution of the

authors was considering the variability of the range of EVs. In the segments of small vans, EVs are often the most competitive technology. In the segment of large vans, diesel has seen the most interesting solution from a financial point of view as electric Car would need to cover a longer distance to be cost-competitive. Hybrid Car are chosen in the segment of trucks as its running costs and fixed costs are lower than the diesel truck. (Philippe LeBeau, 2015)

35. Consumer preferences for electric Car: by Fanchao Liao, Eric Molin & Bert van Wee.

Widespread adoption of EVs may contribute to lessening of problems like environmental pollution, global warming, and oil dependency. However, this penetration of EV is comparatively low despite governments implementing strong promotion policies. They presented a comprehensive review of studies on consumer preferences for EV aiming to convey policymakers and give direction to

further research. They compared the economic and psychological approach towards consumer preference for Electric Car. The impact of financial and technical attributes of EV on its utility is generally found to be significant, including its purchase and operating cost, driving range, charging duration, Car performance and brand diversity on the market. The density of charging stations also positively affects the utility and promotion of EV. The impact of incentive policies, tax reduction is quite effective. (Fanchao Liao, 2017)

36. International Council on Clean Transportation: Lingzhi Jin, Peter Slowik

The early market growth for electric Car continues, but several barriers prevent their widespread uptake. These barriers include the additional cost of the new technology, relative inconvenience of technology considering range and charge times, and consumer understanding about the availability and viability of the technology. This last point, typically referred to as “consumer awareness,” is crucial. (Lingzhi Jin, 2017)

37. Study on Electric Car in India Opportunities and Challenges: by Mohamed M, G TamilArasan, and G Sivakumar

The replacement of ICE with electric engines will reduce pollution to a great extent and be profitable to consumers. Many countries have implemented this technology and are contributing to the improvement of the environment. The researcher saw the opportunities and challenges faced in India over implementing EVs. Opportunities like Government Initiatives, Batteries, Industries, and Environment have been considered. With these challenges like cost of EVs, efficiency of EVs in India and demand for EVs were taken into consideration. The implementation of EVs in India aims primarily to scale back greenhouse emissions and cut oil expenses. The govt. should make the foremost out of the opportunities available and find suitable ways to tackle the challenges. (Mohamed M, 2018)

38. Electric Car in India: Market Analysis with Consumer Perspective, Policies, and Issues: Pritam K. Gujarathi, Varsha A. Shah, Makarand M. Lokhande

Indian Scenario is different because the current market share of EV/PHEV is around 0.1%. Presently almost all Car consider fossil fuel-based transportation. These pollute the atmosphere by the emission of greenhouse gases & causes global warming. The gap between domestic petroleum production and consumption is widening. India imports around 70% of oil required per annum. Hence there is an urgent need to investigate factors and challenges for sustainable and cleaner alternatives. (Pritam K. Gujarathi, 2018)

39. Perception and Awareness Level of Potential Customers towards Electric Car: Masurali.A, Surya P

India contributes around 18% in transport sector alone in terms of carbon emission. The Electric Car (EV) is one of the foremost feasible alternative solutions to beat the crises. Several automotive companies are introducing EVs and are expanding their portfolio. Promoting EVs can help reduce fuel dependence and pollution and beneficial for both consumers and the nation. The education of people has significantly higher influence over their awareness level on EVs. Apart from manufacturers, Government should strive hard to spread awareness and influence positive perception among potential customers. (Masurali.A, 2018)

**40. A Study of Consumer Perception and Purchase Intention of Electric Car:
Pretty Bhalla, Inass Salamah Ali, Afroze Nazneen**

Choice of Car depends upon environmental concern, cost, comfort, trust, technology, social acceptance, infrastructure availability. These arguments have been tested for both conventional Car and EVs. They assume that these factors have direct influence on individual choice of Car. They found that EV.

manufacturers and Government must invest more in social acceptance of the Car by creating more infrastructural facilities, putting more thrust on technology to create trust. The analysis depicts that the population is aware of the environmental benefits. The responsibility lies on the shoulders of the Government and manufacturers to investing in the manufacturing of Car. (Pretty Bhalla, 2018)

41. Electric Car for India: Overview and Challenges: by Mr. A. Rakesh Kumar, Dr. Sanjeevikumar Padmanaban

Global pollution is on the rise and each effort made, is to cut back the CO₂ emissions and save the earth. One such effort is the introduction of EVs. The transport sector is one in all the largest emitter of CO₂ and hence it is important to reduce it. The government has come up with ambitious plans of introducing EVs to the Indian market and confine pace with the event of EVs globally. The National Electric Mobility Mission Plan 2020 has included an in-depth report on the EVs. India encompasses a huge challenge in shifting the transportation sector from ICE engines to EVs. This needs lots of planning along with R&D. Charging infrastructure must be adequately built to deal with range anxiety. It is vital to form demand generation by making all government buses electric and offering tax exemptions for personal EV owners. (Mr. A. Rakesh Kumar, 2019)

42. Opportunities and Scope for Electric Car in India: by Janardan Prasad Kesari, Yash Sharma, Chahat Goel

Developing an aggressive strategy for the adoption of EVs in India and ensuring a well-executed implementation is a challenge but vital for government. The geography and

diversity of India will present problems that require thoughtful solutions. Public procurement is expected to be an important driver of growth of EVs, with the purchase of four-wheeled Car for government offices, three- wheeled Car and buses for public transport. Investments by fleet operators such as Ola and Uber, and operators of food distribution services, are also expected to boost the initial growth of two- and four- wheeled electric Car.

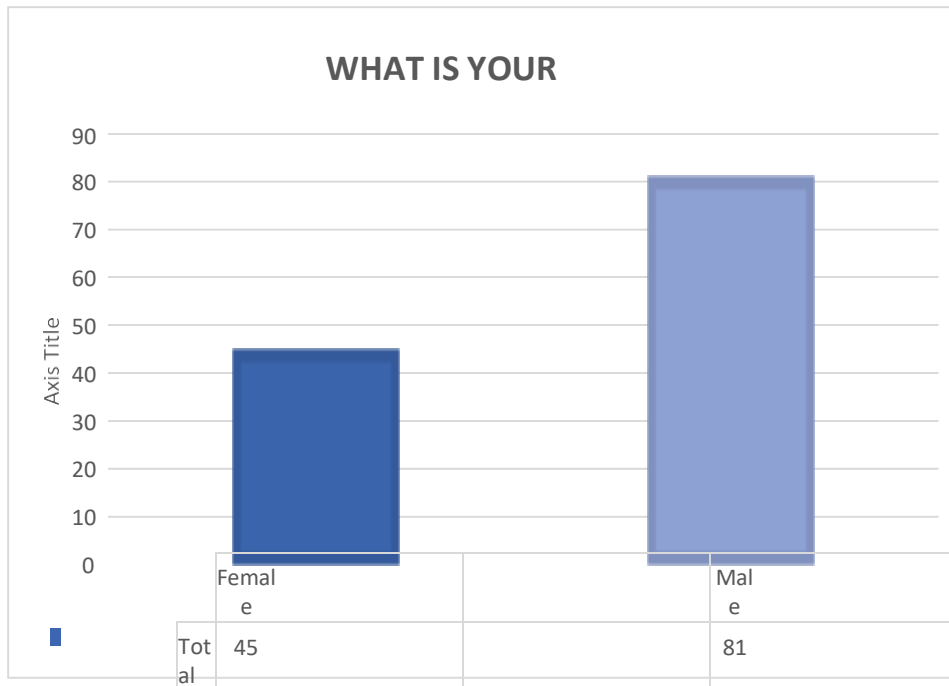
However, the private EVs may take 5-6 years to gain popularity and acceptance. (Janardan Prasad Kesari, 2019)

43. Indian Electric Car Storm in a teacup: Yogesh Aggarwal, Vivek Gedda and Kushan Parikh

Users of scooters, who need only to travel short distances, may consider an EV, but those, who need to travel longer distances and already own bikes like a Hero Splendor, may find it difficult to move to an e- 2W. For Car, it is relatively simple to improve the range with increased battery size. For electric 2Ws though, every increase in kWh may provide an extra 30km in range, but the increase in weight is around 10kg, approximately a 10% increase in the total weight of the bike. This weight issue is even more pronounced in smaller bikes (less than 150cc). (Yogesh Aggarwal, 2019)

4 Data Analysis and Interpretation

Chart: 1 What is your Gender?

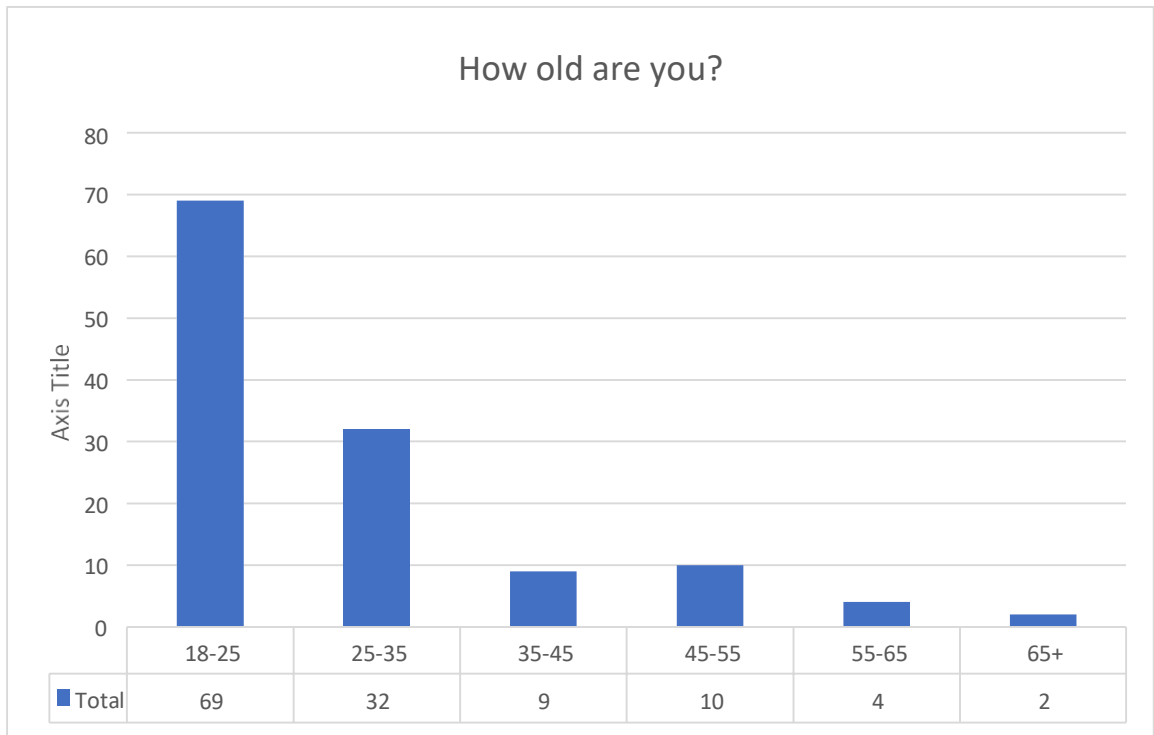


Source: Chart prepared by the researcher at the basis of survey data.

Gender is an important consideration in development. It is a way of looking at how social norms and power structures impact on the lives and opportunities available to different groups of men and women. Globally, more women than men live in poverty.

The table below shows the frequency distribution of respondent's gender. From the table, it is inferred that most of the respondents were male i.e., 81 while 45 are females.

Chart: 2 How old are you?

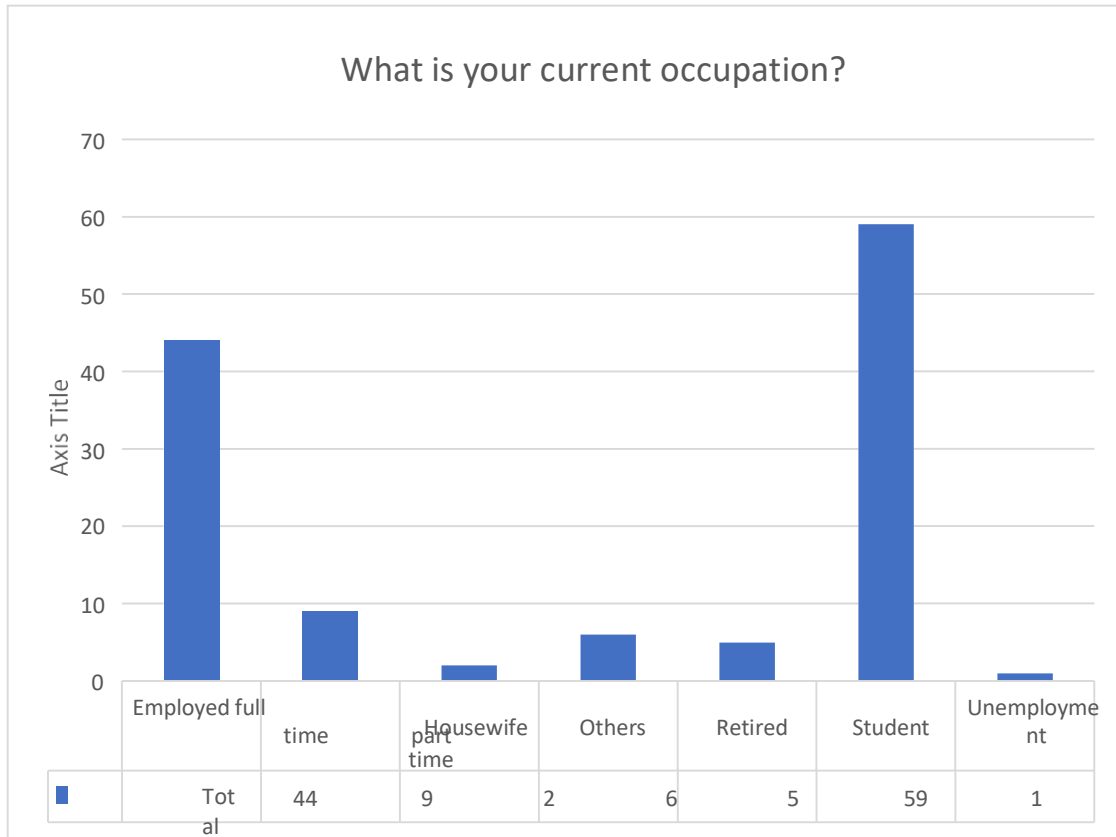


Source: Chart prepared by the researcher at the basis of survey data.

Individuals who grow up at the same time are called cultural generations. They often share many of the same experiences as others of the same age group. Here we try to Understand Different Generations. Each of these four generations has a different set of values, beliefs, and attitudes.

Age of the respondents is extremely important for the marketers to know what kind of marketing messages. This is a tabular representation of the data collected from 129 participants regarding their age.

Chart: 3 What is your current occupation?

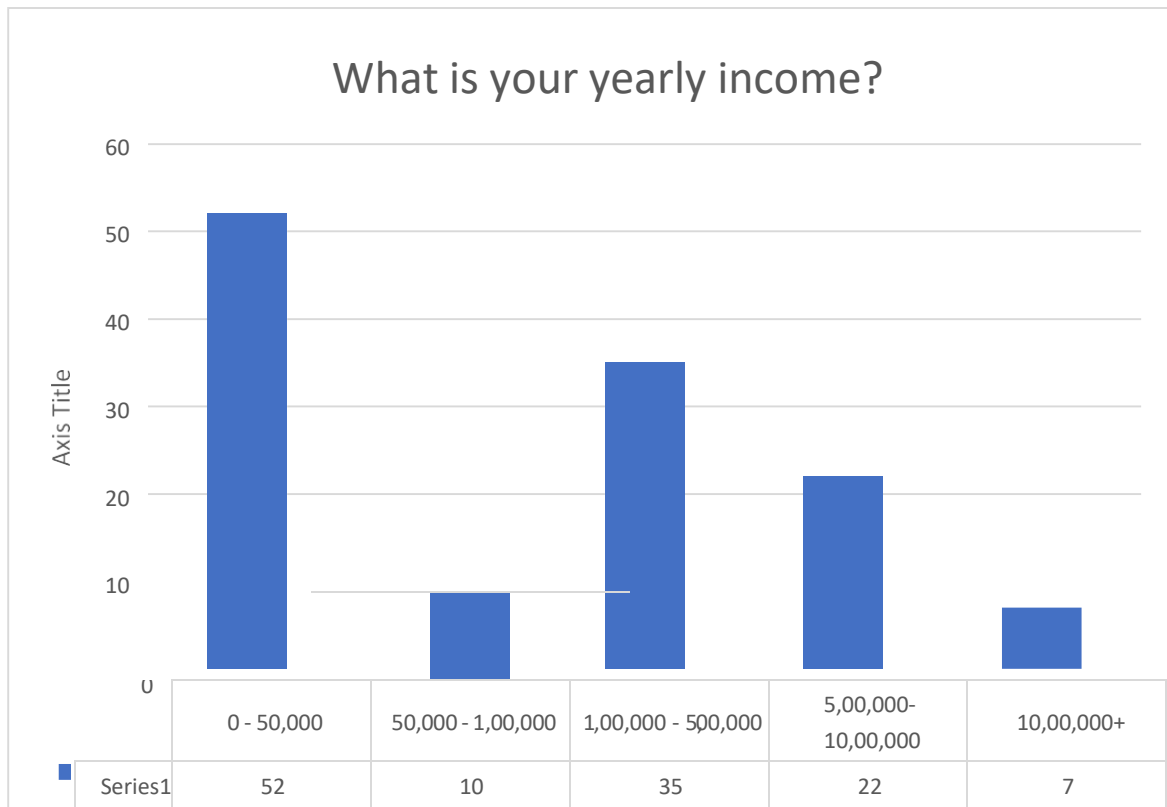


Source: Chart prepared by the researcher at the basis of survey data.

Occupation helps us to maintain our living standard. It enhances the qualification, skills, and capacities of professionals.

The occupation of the respondent covers many categories starting from a student and ending at retired. The table below shows, what activities the survey participants are engaged in.

Chart: 4 What is your yearly income?

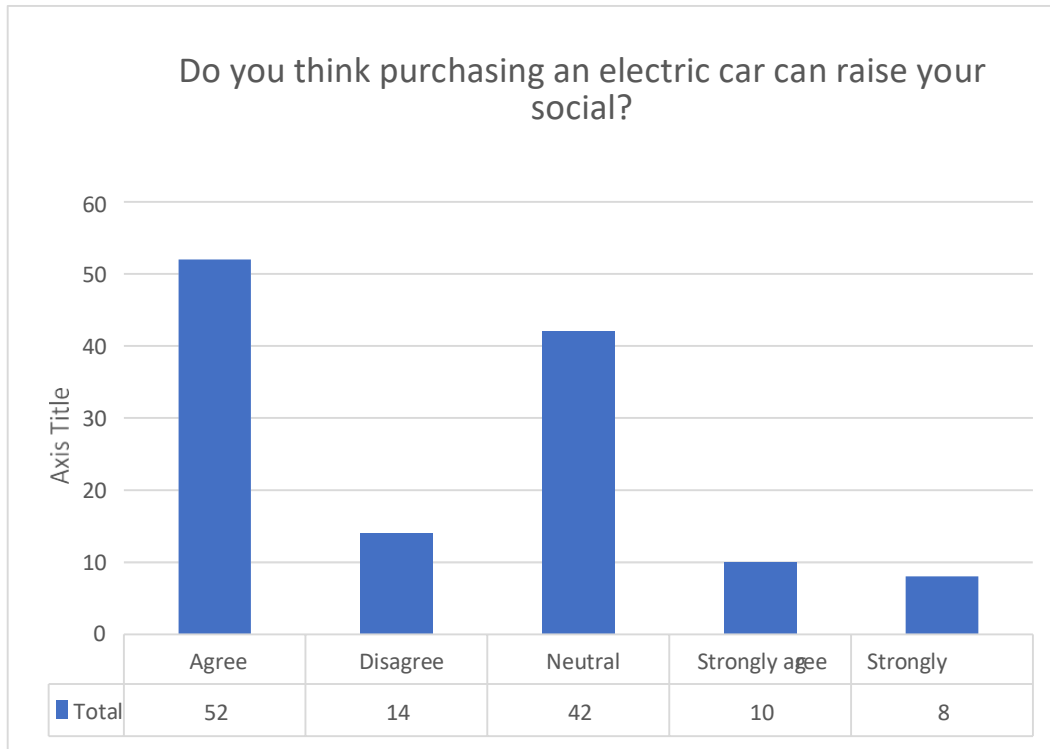


Source: Chart prepared by the researcher at the basis of survey data.

In any research it is very important to know income status of an individual because through which one's standard of living can be decided, and many other attributes are dependent on income so to have a basic idea about income is necessary for any researcher.

As far as the early income of respondent is concern; we can say that mostly respondent is from middle class i.e., approx. 55 respondents are having income of 1lakh to 5 lakhs.

Chart: 5 Do you think purchasing an electric car can raise your social status?



Source: Chart prepared by the researcher at the basis of survey data.

EVs help reduce this threat because almost all U.S. electricity is produced from domestic sources, including coal, nuclear, natural gas, and renewable sources. EVs can also reduce the emissions that contribute to climate change and smog, improving public health and reducing ecological damage.

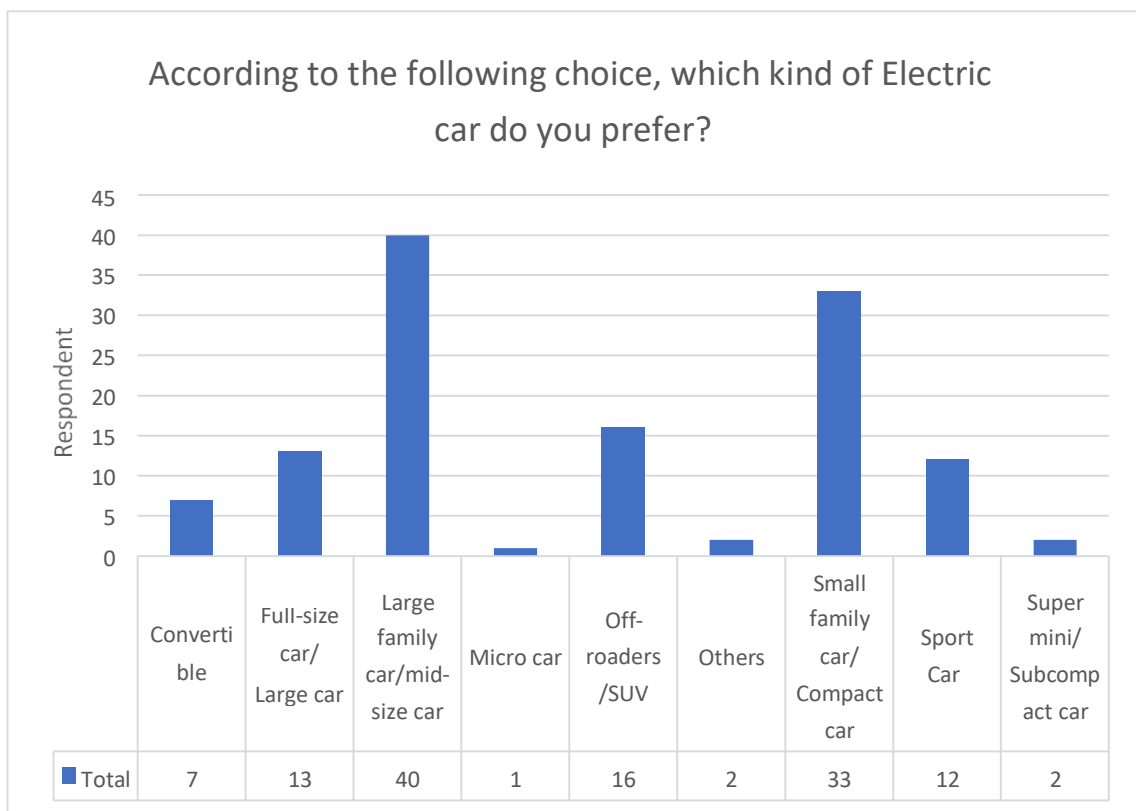
Researcher asked question related to social status; than out of 129 respondent 52 are agrees. So, it clearly means that people are thinking that if they have electric car than social status will be increase.

Chart 6

According to the following choice, which kind of electric car do you prefer?

On basis of questionnaire, I give many options like Friends/ Family, Brand representative (Celebrity), Brochure, Car Shows, Car magazines, Make my own choice, Seller, TV Advertisement, Social Media or any other. This is simply called consumer choice and Consumer choice refers to the decisions that consumers make regarding products and services. When we study consumer choice behavior, we examine how consumers decide which products to purchase or consume over time.

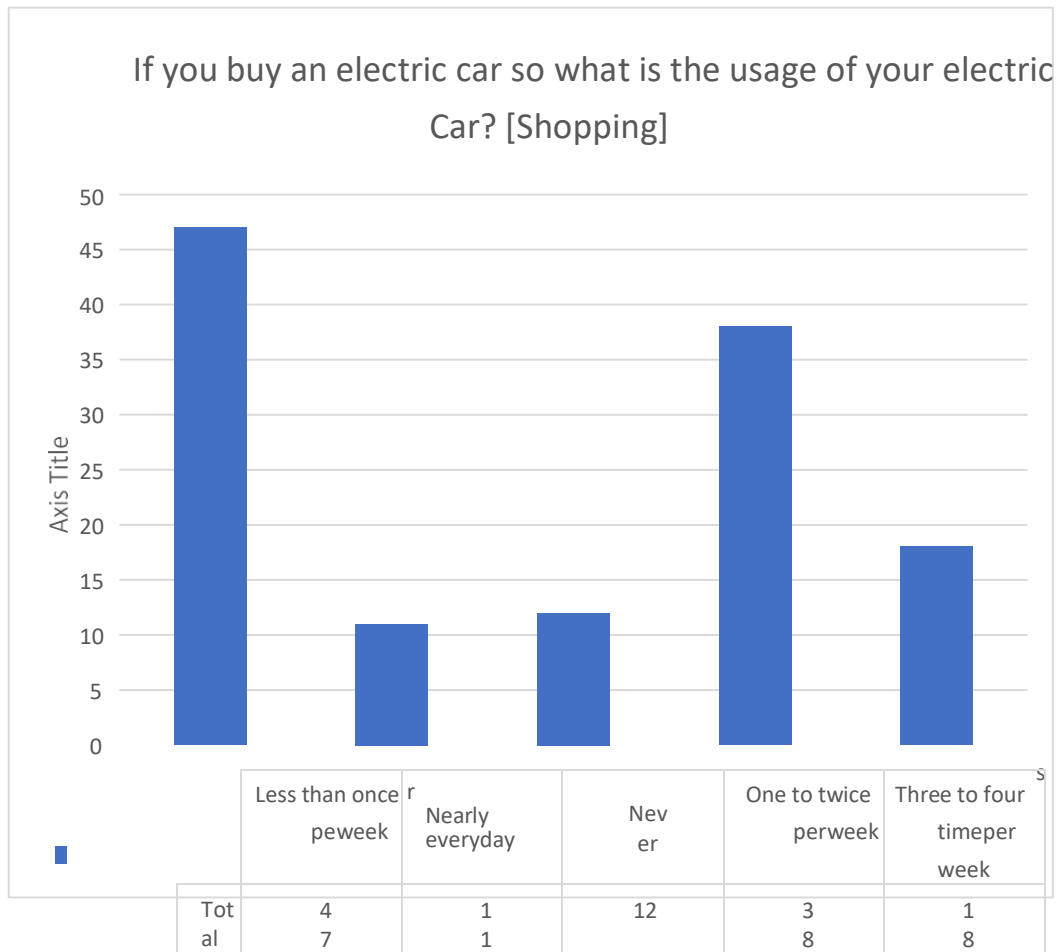
Chart: 7 According to the following choice, which kind of electric car do you prefer?



Source: Chart prepared by the researcher at the basis of survey data.

Here, 40 respondents prefer large car, and 33 respondents prefer small compact car; so, we can conclude that people are preferring normal routine car; no more modification is required by them.

Chart: 8.1 If you buy an electric car so what is the usage of your electric car? (shopping)

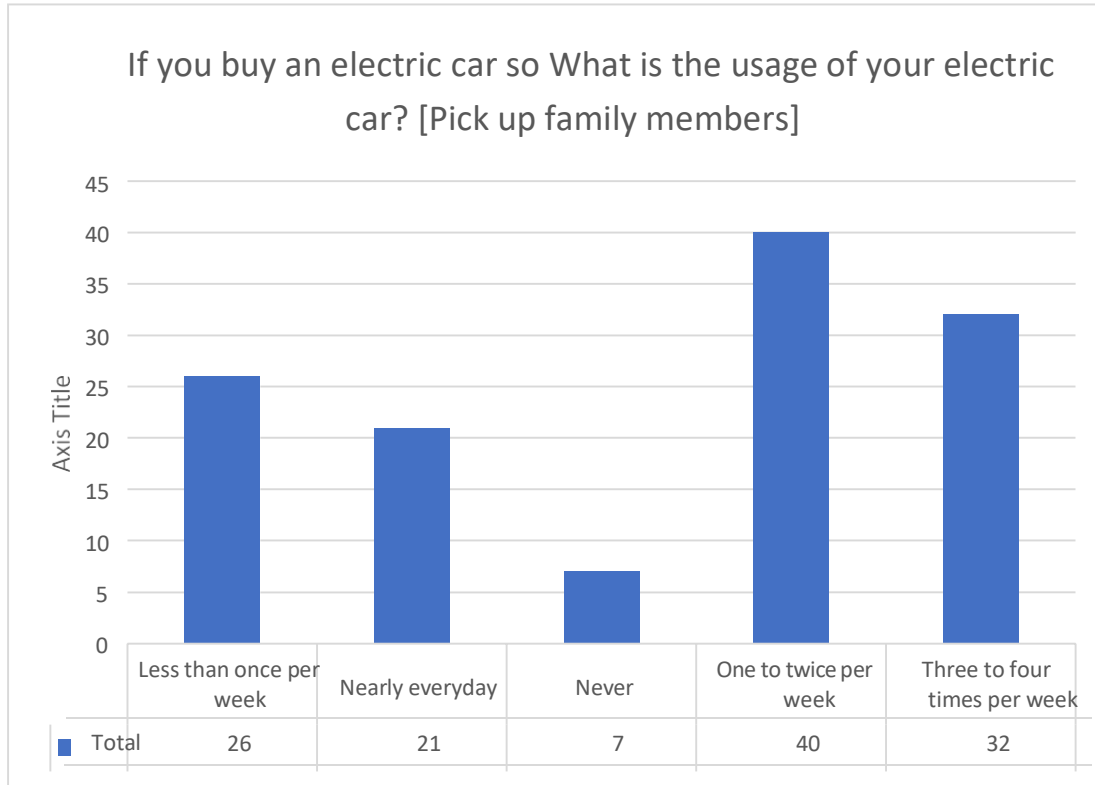


Source: Chart prepared by the researcher at the basis of survey data.

Plug-in electric Car (also known as electric Car or EVs) are connected, fun, and practical. They can reduce emissions and even save you money. Fueling with electricity offers some advantages not available in conventional internal combustion engine Car.

Here, research asked question for usage purpose then out of 129 respondents approx. 85 respondents said that they are going to use this car not more 2 time in a week.

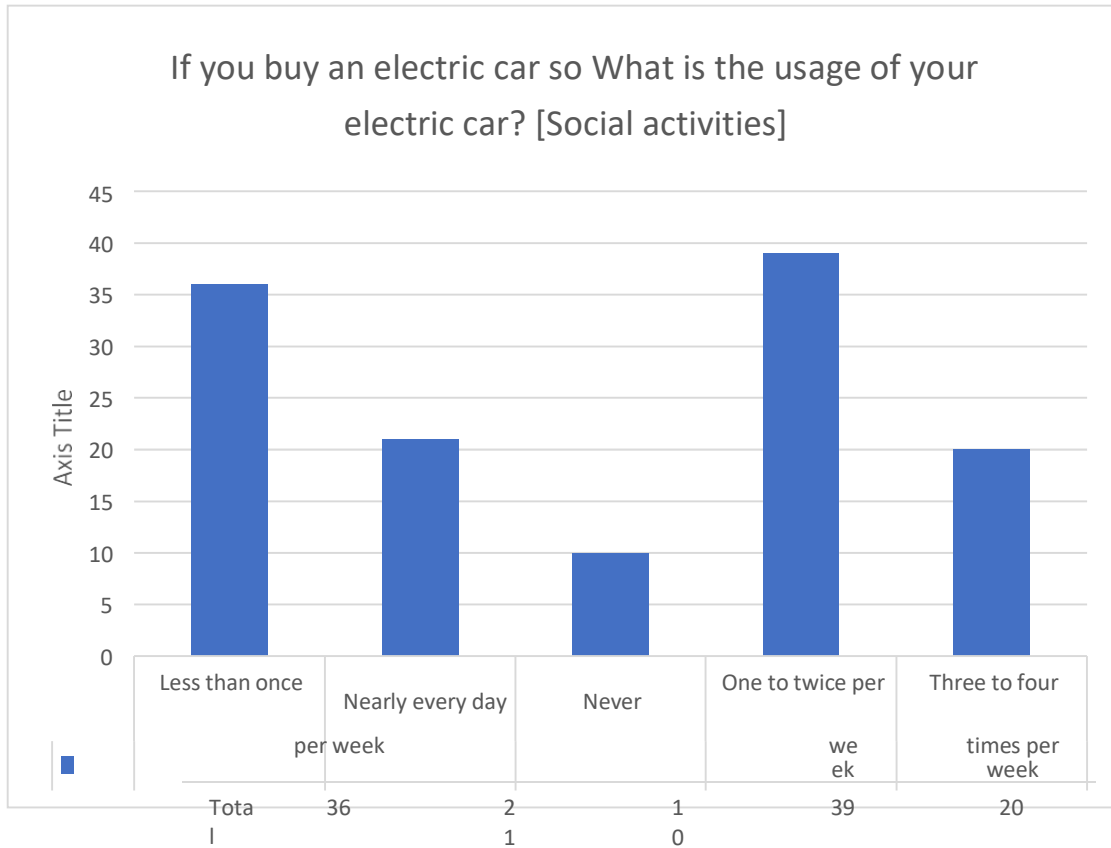
Chart: 8.2 If you buy an electric car so what is the usage of your electric car? (pick up family members)



Source: Chart prepared by the researcher at the basis of survey data.

Here, research asked question for usage purpose then out of 129 respondents approx. 70 respondents said that they are going to use this car more 2 time in a week.

Chart: 8.3 If you buy an electric car so what is the usage of your electric car? (social activity)

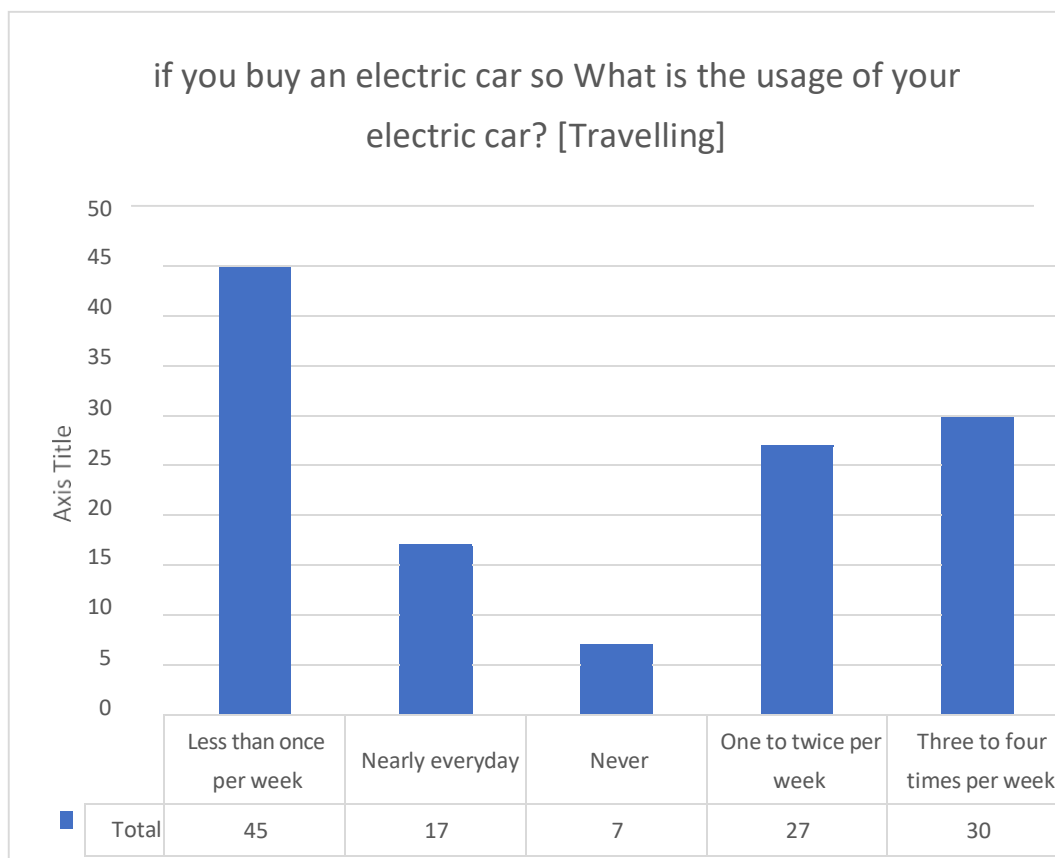


Source: Chart prepared by the researcher at the basis of survey data.

Societal benefits for EVs include national security benefits, better air quality and health, domestic economic development, and environmental benefits. This research study applies this established model for evaluating clean energy programs to the evaluation of electric Car using the Societal Cost Test.

Here, research asked question for usage purpose then out of 129 respondents approx. 59 respondents said that they are going to use this car more 2 time in a week for socialactivity.

Chart: 8.4 If you buy an electric car so what is the usage of your electric car? (travelling)

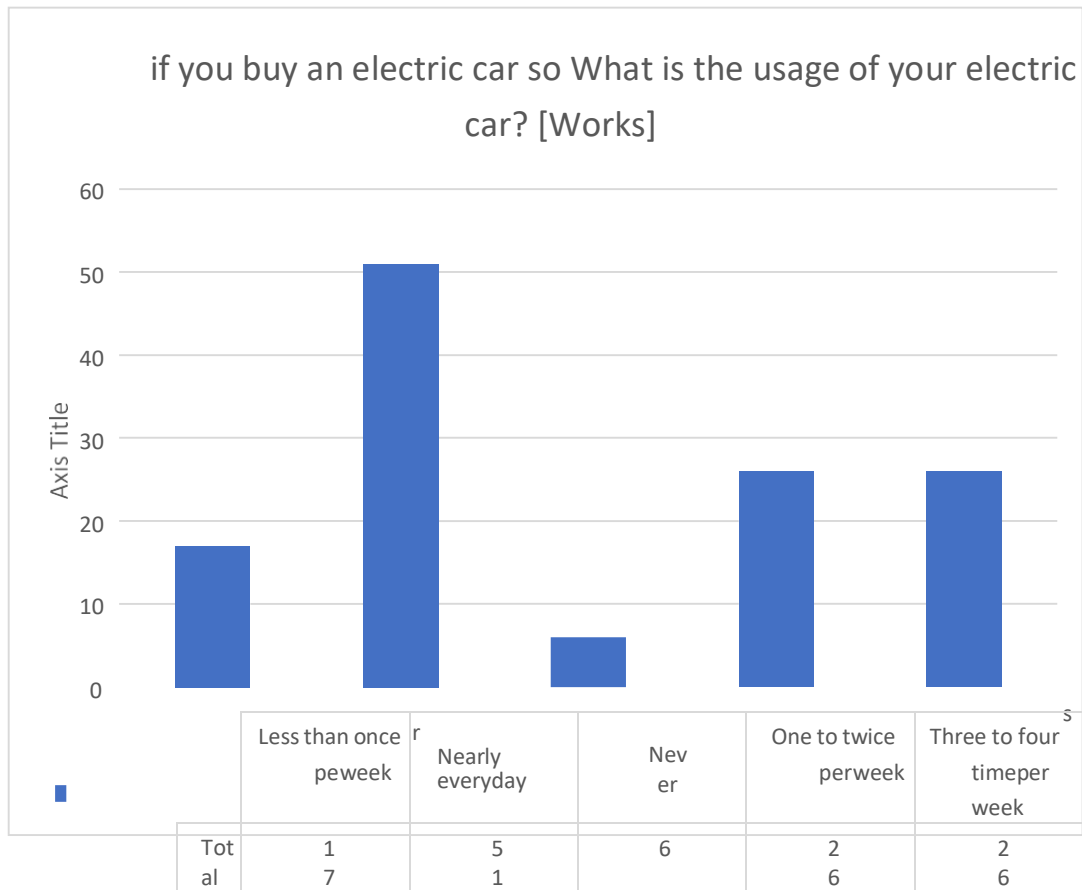


Source: Chart prepared by the researcher at the basis of survey data.

Something like the BMW i3 94ah has a 153-mile range and — if you do not mind making a few stops — can be a good bet for long trips. If you want to avoid frequent charges, consider a long-range Tesla or a Chevrolet Bolt. These cars have well over 200 miles of electric range.

Here, research asked a question for usage purpose then out of 129 respondents approx. 45 respondents said that they are not going to use this car for travelling purpose.

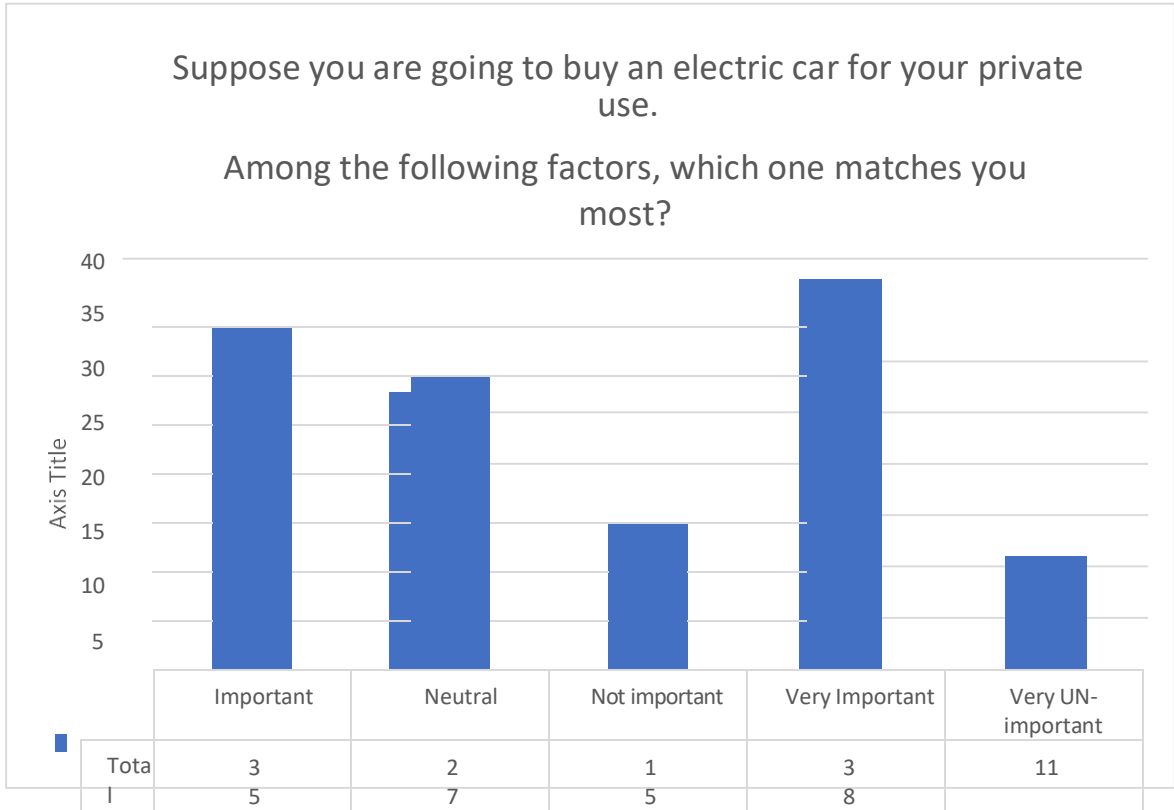
Chart: 8.5 If you buy an electric car so what is the usage of your electric car? (work)



Source: Chart prepared by the researcher at the basis of survey data.

Here, research asked question for usage purpose then out of 129 respondents approx. 51 respondent said that they are going to use this car every day for their work.

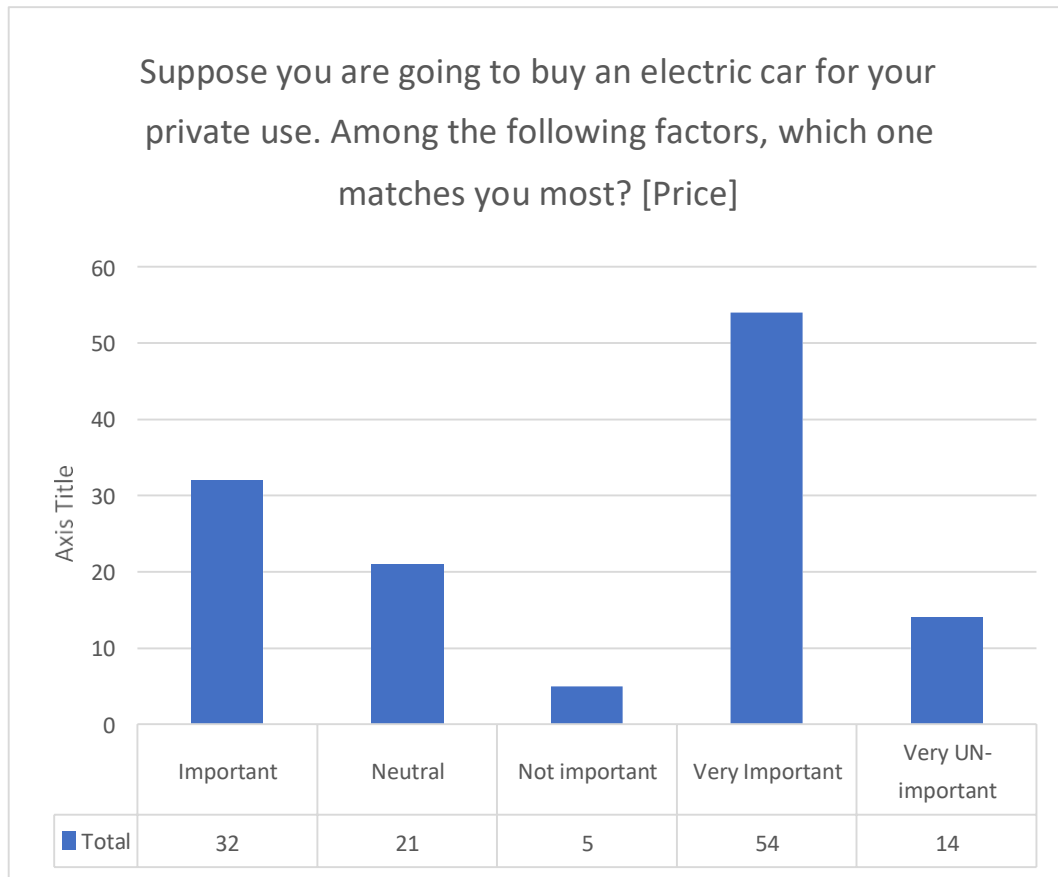
Chart: 9.1 Suppose you are going to buy an electric car for your private use among the following factors, which one matches you most? (brand)



Source: Chart prepared by the researcher at the basis of survey data.

Here, research asked question about brand then out of 129 respondents only 15 respondents said that brand is not important; whereas all other respondents believe that brand is important factor while purchasing car.

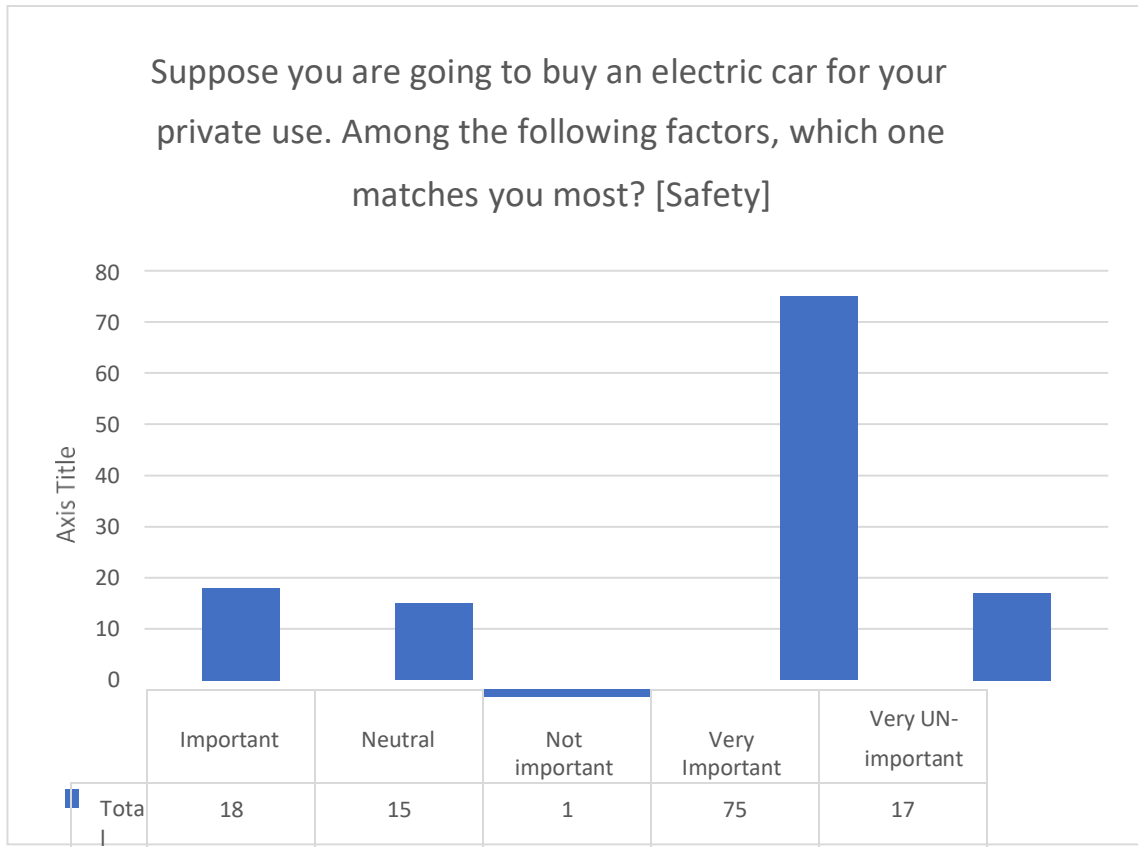
Chart: 9.2 Suppose you are going to buy an electric car for your private use among the following factors, which one matches you most? (price)



Source: Chart prepared by the researcher at the basis of survey data.

Here, researcher ask question about price than 54 respondents said that price is veryimportant factor while purchasing. For price consideration is the main factor for every product

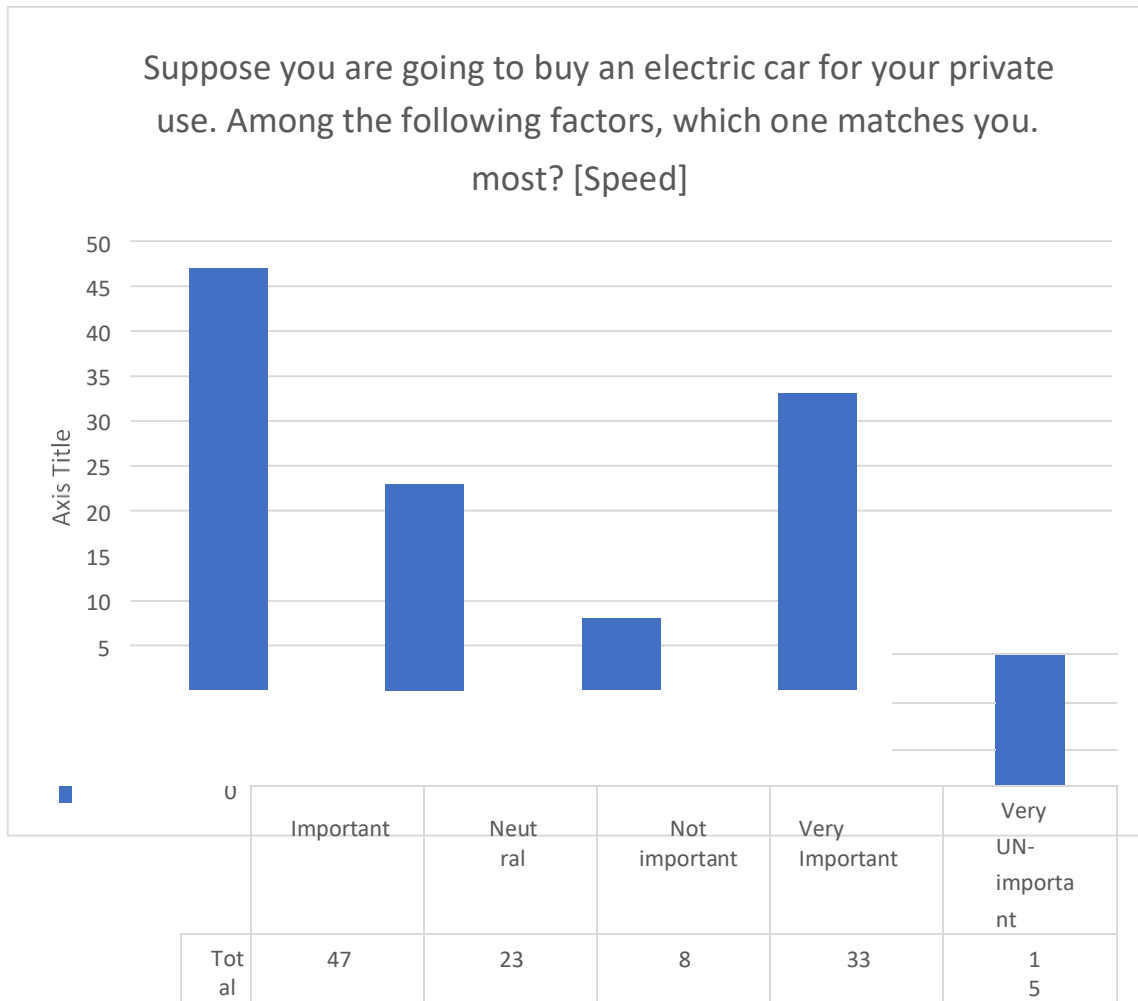
Chart: 9.3 Suppose you are going to buy an electric car for your private use among the following factors, which one matches you most? (safety)



Source: Chart prepared by the researcher at the basis of survey data.

As we discussed that price is very important factor at same time safety is also important for us. Here 75 respondents said that safety is one the most important factor that we needto consider.

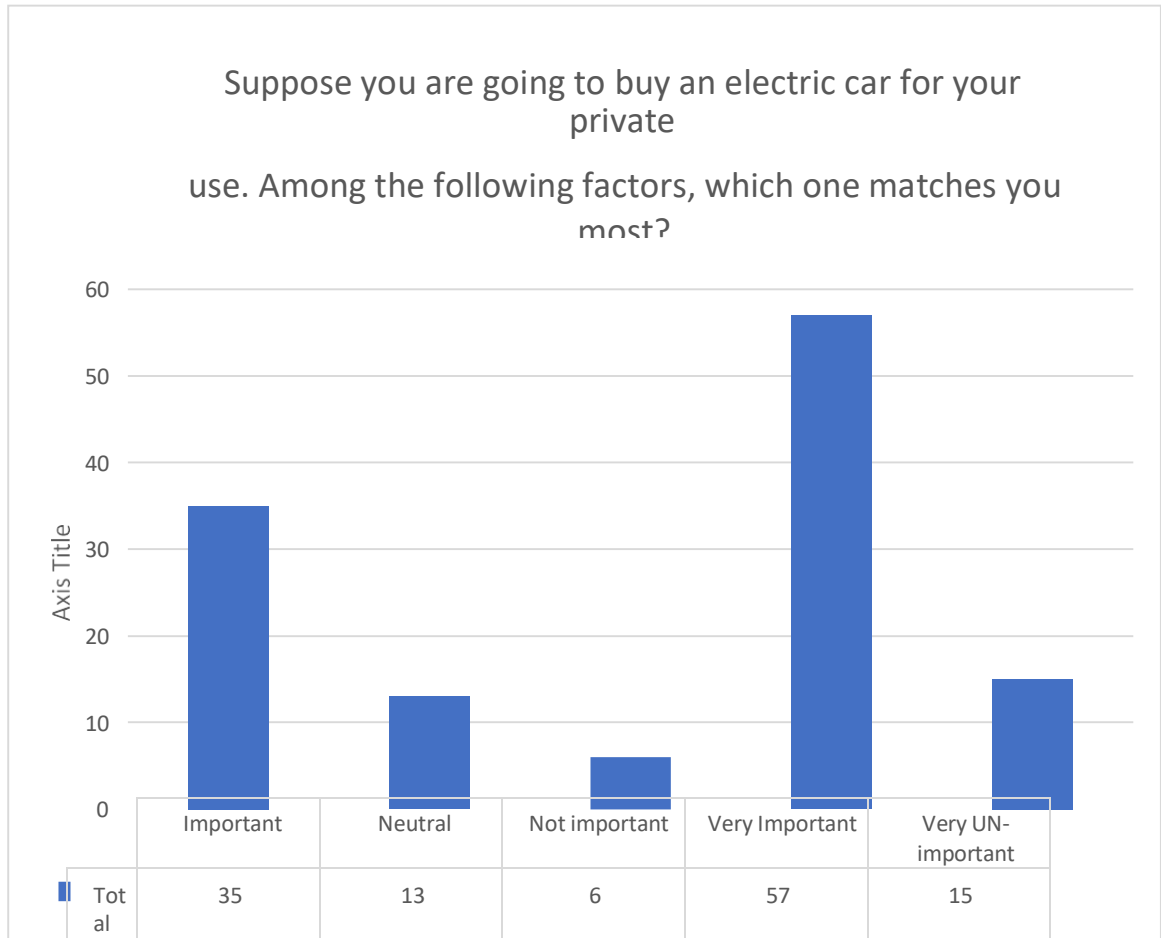
Chart: 9.4 Suppose you are going to buy an electric car for your private use among the following factors, which one matches you most? (speed)



Source: Chart prepared by the researcher at the basis of survey data.

In most of the case electric car are not proving that much speed what petroleum car does, although with the use of technology they are now providing car with high speed. Here there are approx. 80 respondents out of 129 consider these factors.

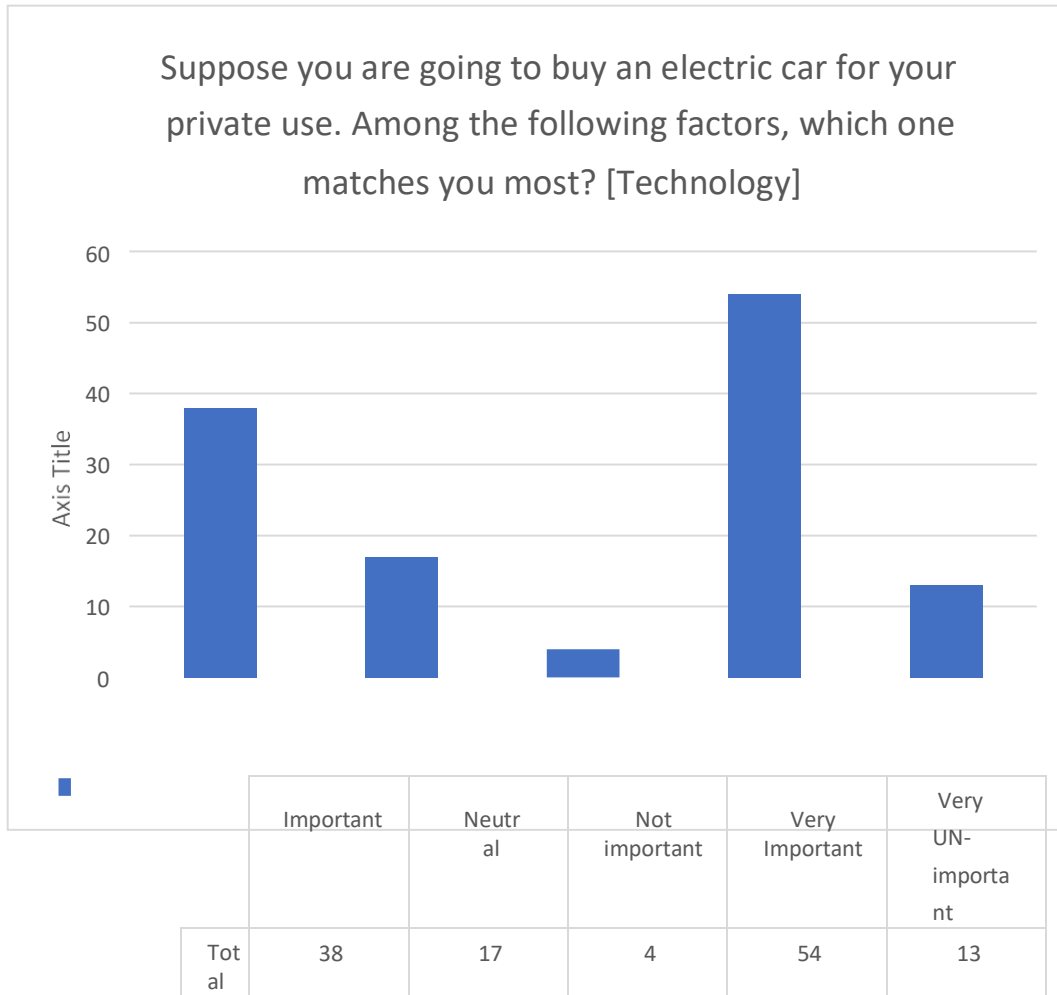
Chart: 9.5 Suppose you are going to buy an electric car for your private use among the following factors, which one matches you most? (performance)



Source: Chart prepared by the researcher at the basis of survey data.

As customer are ready to pay any amount for the product, they want performance. Here, also 57 respondents want performance of these electric Car.

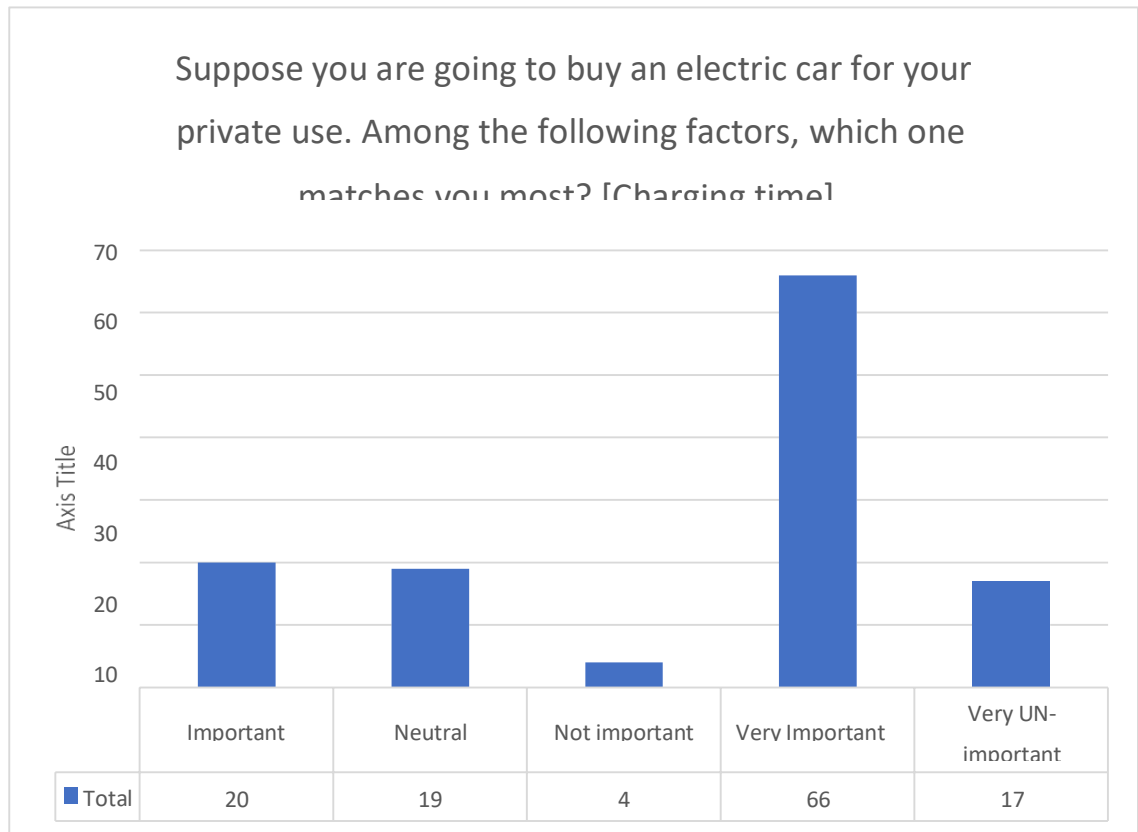
Chart: 9.6 Suppose you are going to buy an electric car for your private use among the following factors, which one matches you most? (technology)



Source: Chart prepared by the researcher at the basis of survey data.

On the base of the technology, they can provide the speed and performance in electric Car. So, 54 respondents are thinking that technology is important factor.

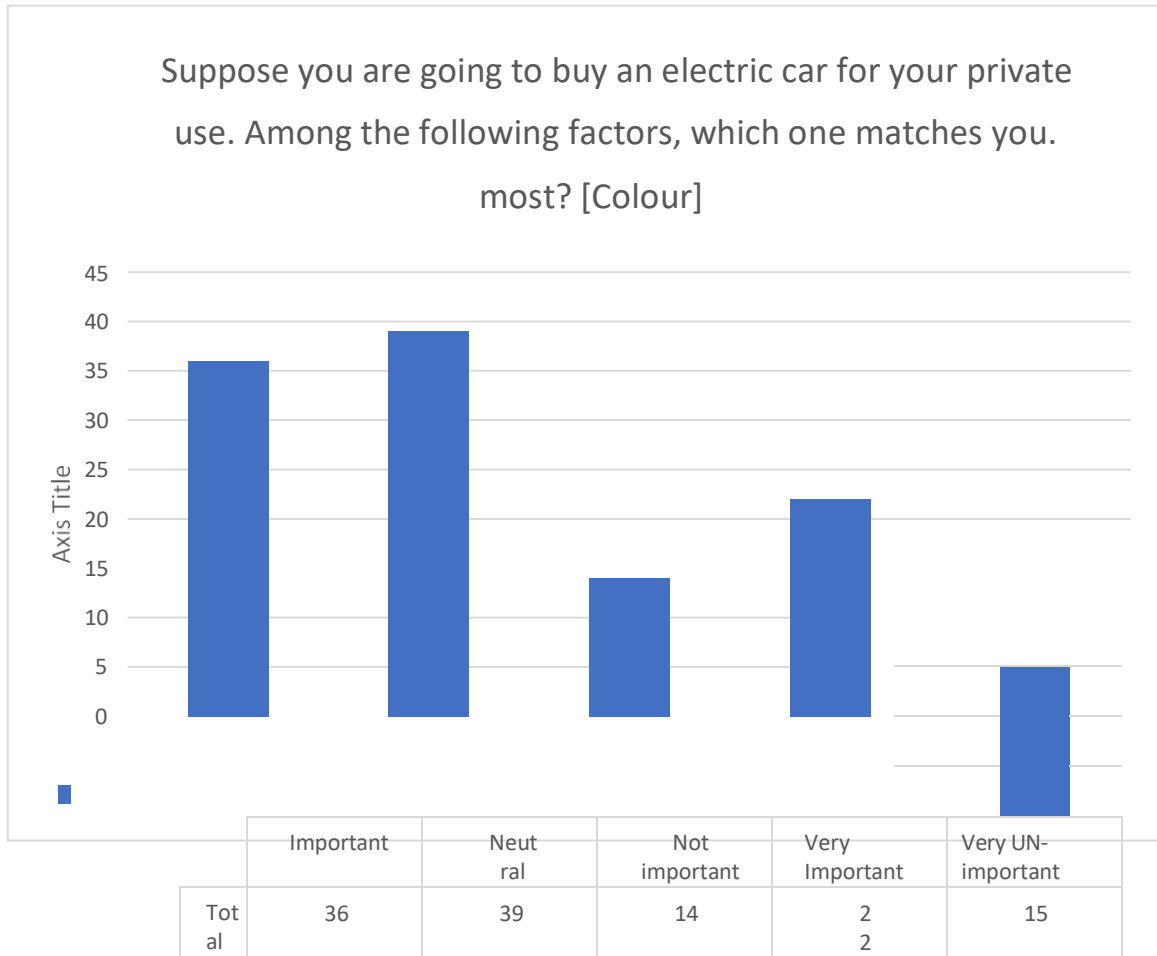
Chart: 9.7 Suppose you are going to buy an electric car for your private use among the following factors, which one matches you most? (charging time)



Source: Chart prepared by the researcher at the basis of survey data.

As we discussed that technology is playing major role in this competitive era. Now, their possibility that electric Car may want less charging time and it is also considered by respondents as one of the important factors.

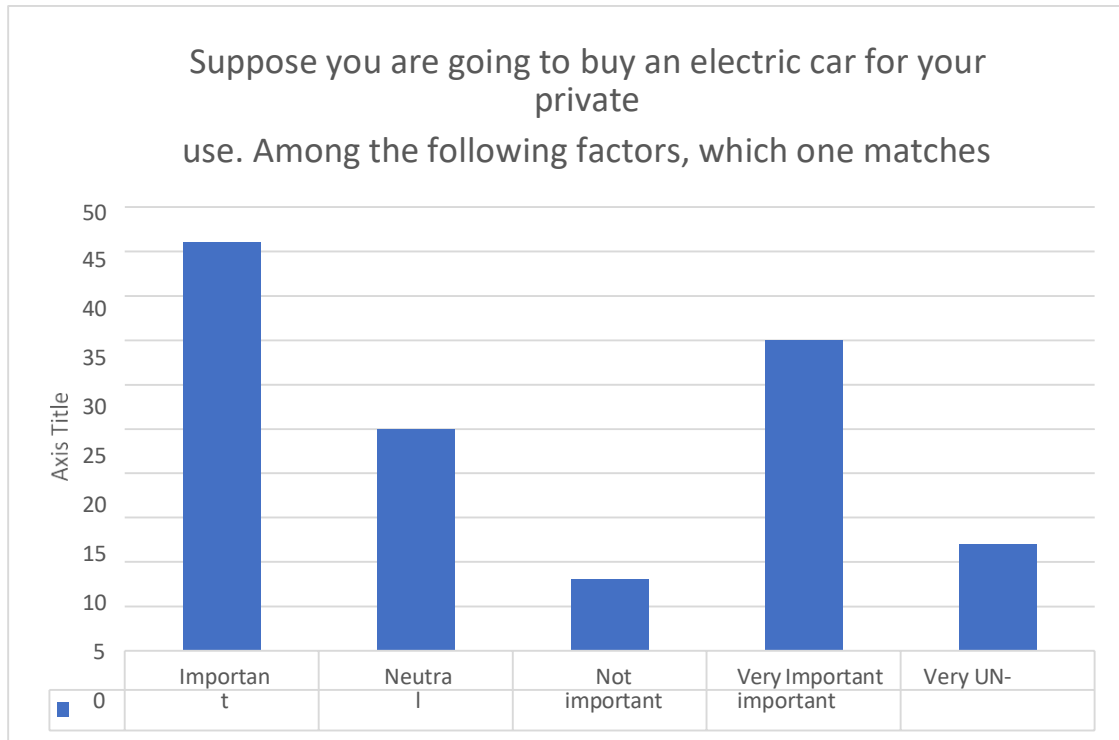
Chart: 9.8 Suppose you are going to buy an electric car for your private use among the following factors, which one matches you most? (color)



Source: Chart prepared by the researcher at the basis of survey data.

Now-a-days any type of Car have different costing as per the color of the Car;out of 1229 respondent approx. 60 respondents said that color is most important aspect when we are purchasing Car.

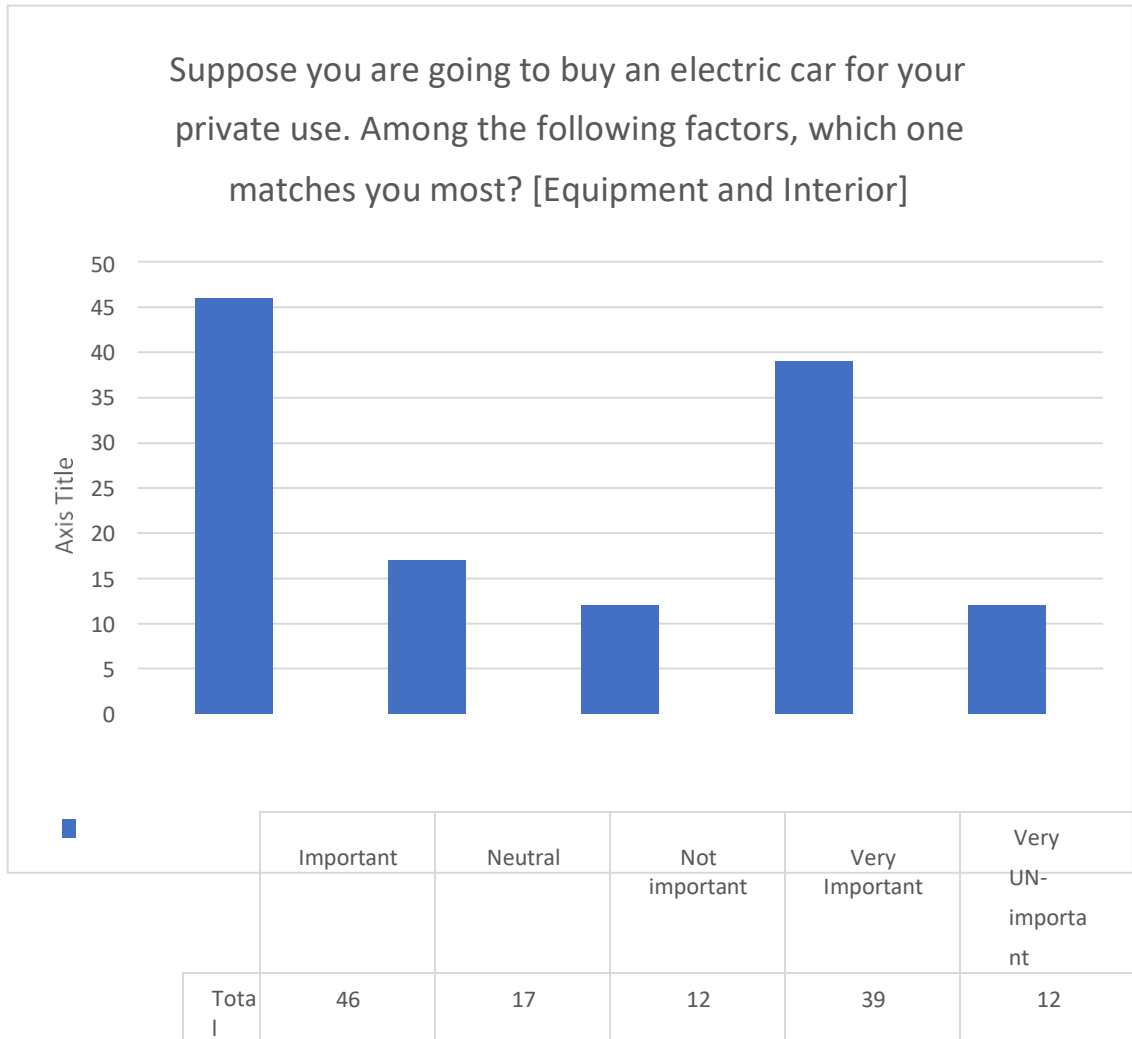
Chart: 9.9 Suppose you are going to buy an electric car for your private use among the following factors, which one matches you most? (size)



Source: Chart prepared by the researcher at the basis of survey data.

As company is charging the price by considering all the aspect; size of Car is one of the aspects. Here, approx. 80 respondents are feeling that size of Car is very important.

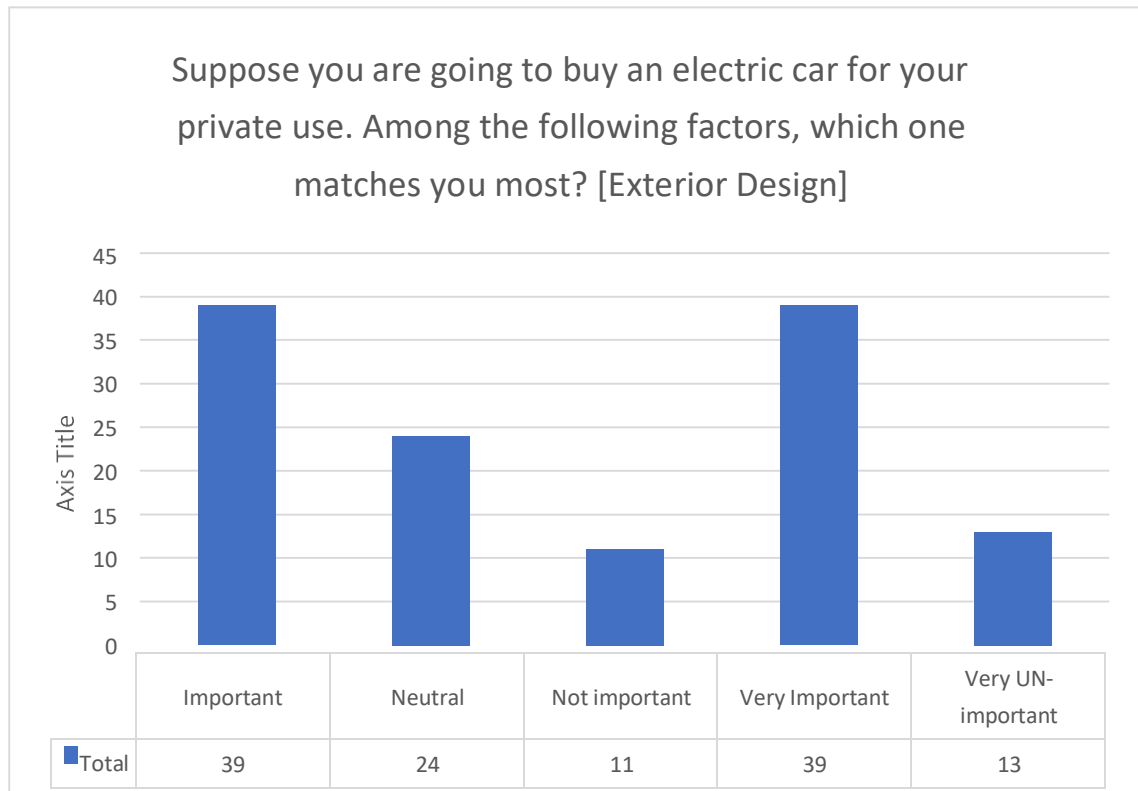
Chart: 9.10 Suppose you are going to buy an electric car for your private use among the following factors, which one matches you most? (equipment and interior)



Source: Chart prepared by the researcher at the basis of survey data.

Here, approx. 40 respondents said that equipment and interior is not so important, but on the other side 80 respondent were feeling that it is important, and it change the show of the Car.

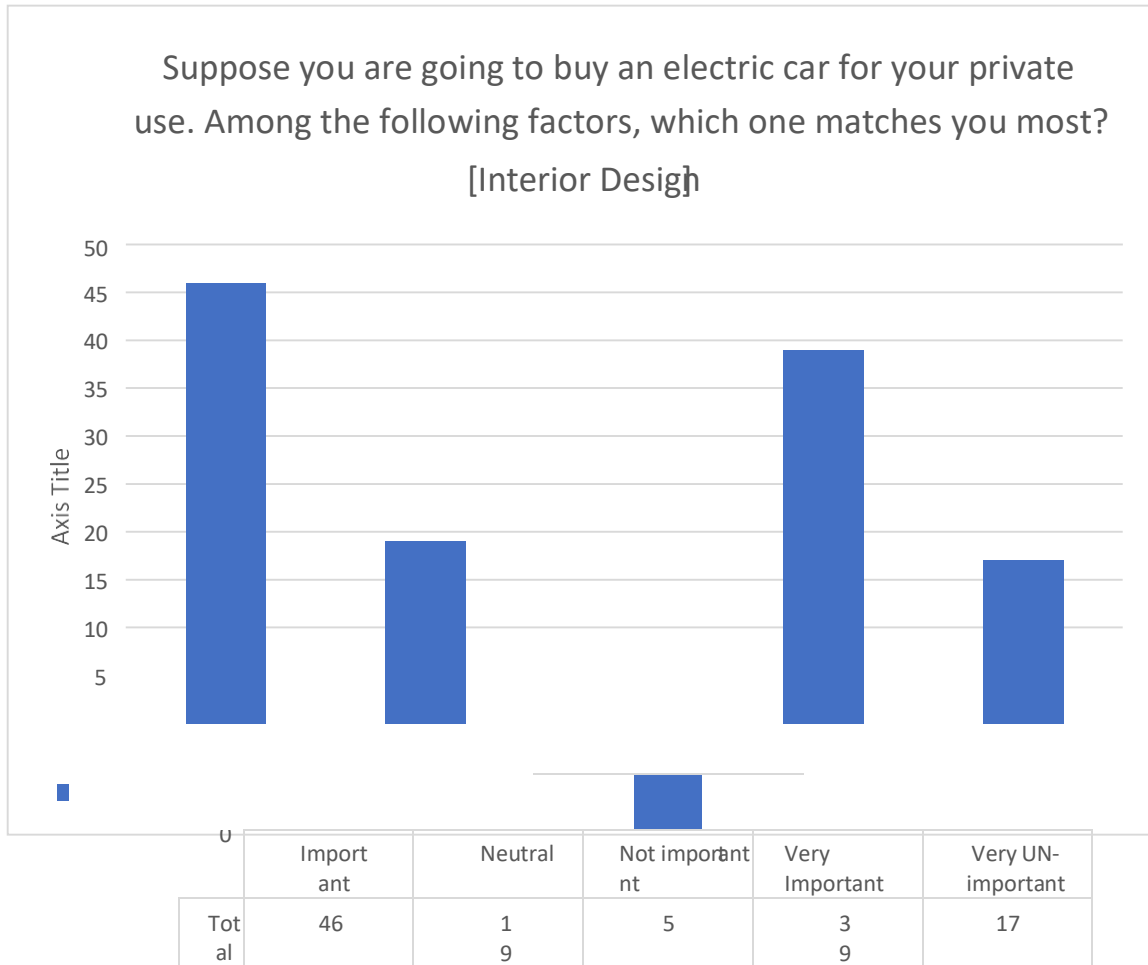
Chart: 9.11 Suppose you are going to buy an electric car for your private use among the following factors, which one matches you most? (exterior design)



Source: Chart prepared by the researcher at the basis of survey data.

Here, approx. 20 respondents said that exterior design is not so important, but on the otherside 80 respondent were feeling that it is important.

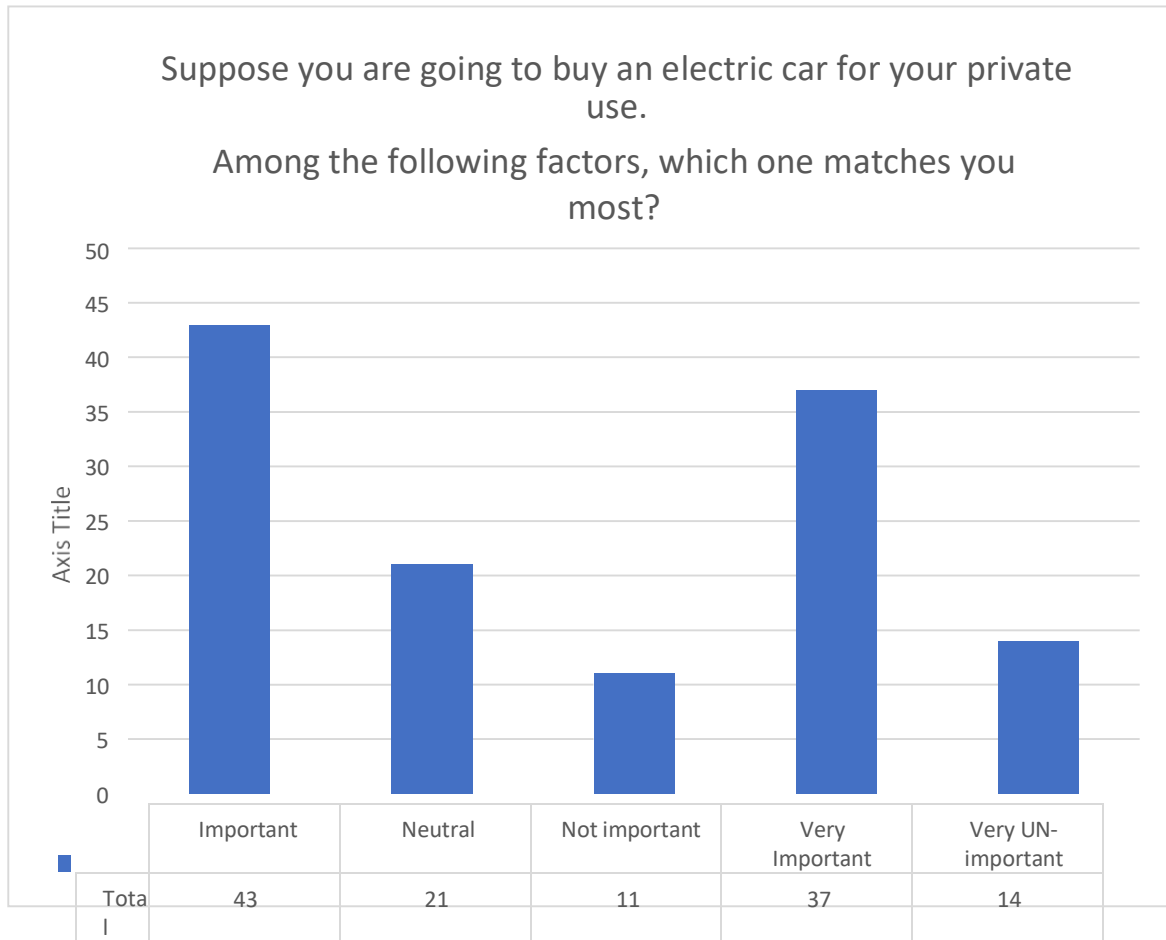
Chart: 9.12 Suppose you are going to buy an electric car for your private use among the following factors, which one matches you most? (interior design)



Source: Chart prepared by the researcher at the basis of survey data.

Here, approx. 20 respondents said that exterior design is not so important, but on the other side 80 respondent were feeling that it is important.

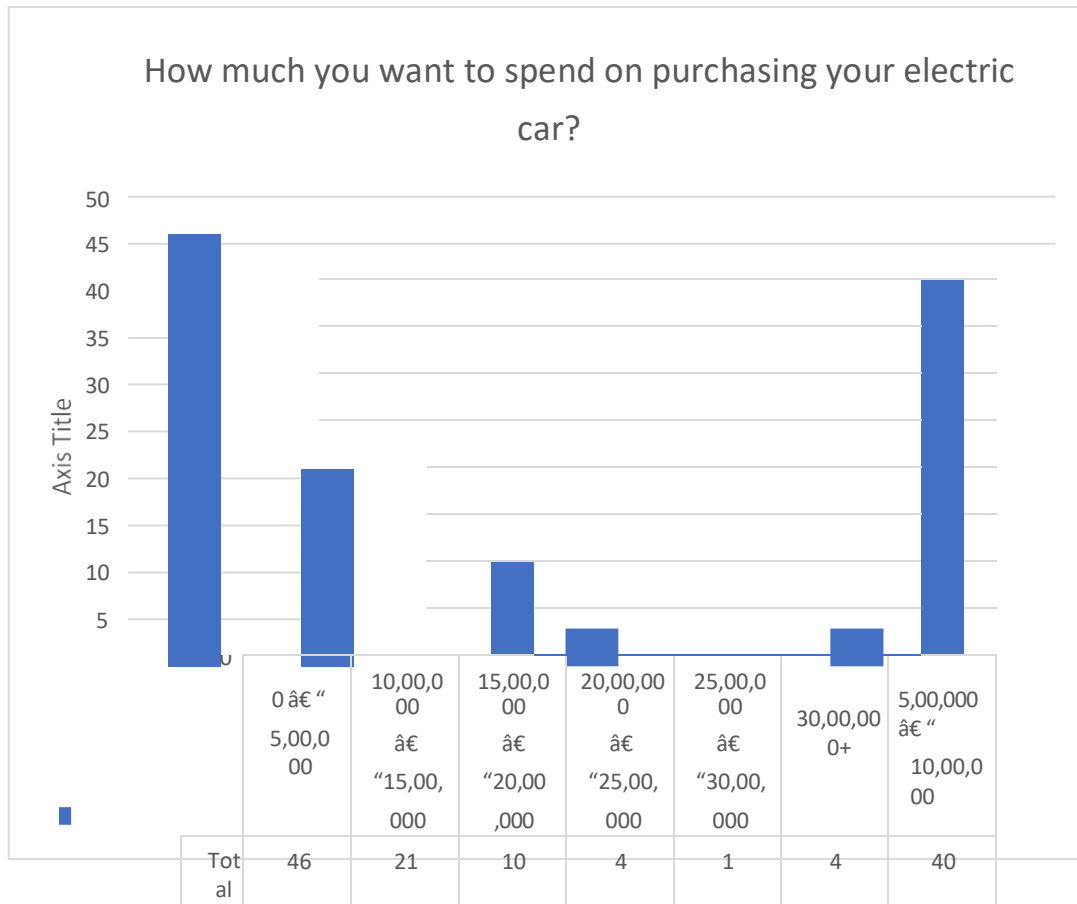
Chart: 9.13 Suppose you are going to buy an electric car for your private use among the following factors, which one matches you most? (resale value)



Source: Chart prepared by the researcher at the basis of survey data.

As once we purchase the any Car the original value is decreased so here also the value of electric Car will be decreased but then also 80 respondents are said it is necessary to see what would be the resell value.

Chart: 10 How much you want to spend on purchasing your electric car?



Source: Chart prepared by the researcher at the basis of survey data.

As the last question of the research but very important question of the study i.e., price and people are ready to pay 5 to 10 lakh rupees for these kinds of electric Car.

5.2 Research summarize:

More of the two-wheeler owners were interested in buying/converting their Car into Electric/Hybrid Car. Most of the people (male) prefer their own Car for daily travelling and the distance travelled by them daily falls in between 40-80 km. Most of the people have their daily travelling in the city as well as on the highway (mixed) or only in the city. 54.3% consumer are 18 to 25 years old and only 5% consumer are 65+ year old consumer. And 45.7% consumer are student and 7% other occupation consumer and 35.7% employee full time. 41.1% consumer yearly income is 0 to 50,000 and only 6.2% consumer yearly income is 10,00,000. 41.1% consumer agree purchasing and electric car raise social status. 6.2% strongly disagree buying electric car can rise social status. In question 58.9% consumer chose buying own choice and 45% family influence to buy an electric car. 38% social media effect, 21% advertisement effect and only 7% consumer select car magazines influence to buy an electric car. In India large family size car mostly purchase because in India mostly joint family living in India

It was found that the present cost of electric Car which is too high. Most of the two-wheeler owners expect the price of their electric Car (two-wheeler) should be in between 30000 to 60000 INR. Most of the Sedan owners expect the price of their electric Car to be around 60000 to 100000 INR. It is assumed with this price they are interested in converting their existing car into Hybrid Car.

The lack of information about the technology before I would make a purchase where the main cause of concern and were preventing people from buying an Electric Car. Majority of the people would like to know more about Electric Car from News Paper Ads and Live Demo Car.

Almost all the people would prefer to charge their Car at home and from public charging stations. Which is a cause of concern as development of such infrastructure is still in nascent stage. Though it was found that majority of the people daily travel around 80km, however still most of the people would expect an Electric Car to travel around 80 to 150 km on single charge. The current Reva can cover 100 km (max.) when fully charged.

Majority of two-wheeler owners and hatchback owners are willing to pay around 5000 to 10000 and 20000 to 50000 INR respectively for the replacement of batteries once exhausted, which is a positive response from consumers. An Electric Car 's batteries have to be replaced with in 4-5 yrs. (Min.) regularly which cost around 20000 to 50000 depending on quality of

the battery. Speed the Electric Car is not a concern with people for buying an Electric Car. Even government subsidies are not a concern with people for buying an Electric Car. It is found that most of the people are ready to pay a onetime premium amount as an additional development or manufacturing cost of infrastructure. It depends on the type of Car own by people for e.g., two-wheeler owners expect to pay a premium amount of 2000 to 5000INR. When it comes to E-Car, the Indian consumers are not that much familiar about the said term. The outcome of this study is to find the buying behavior or Indian consumers especially the factors that can influence the Indian Customers to purchase the E-Car. This study will make the analysis of different factors like Brand, Safety, Price, Performance, use of advanced Technology based on which the Indian customers can take the decision of buying E-Car.

And last comment in questioner also Indian consumer type comment in last question first reply is how much km in one charging, safe car with good look, maintenance cost is also important for consumer and good for environment – eco friendly and cost efficient also loan and money are also affected for consumer, performance, and design, not more expensive, price, trial for purpose, speed, and demand, charging and durability this is main comment in questioner.

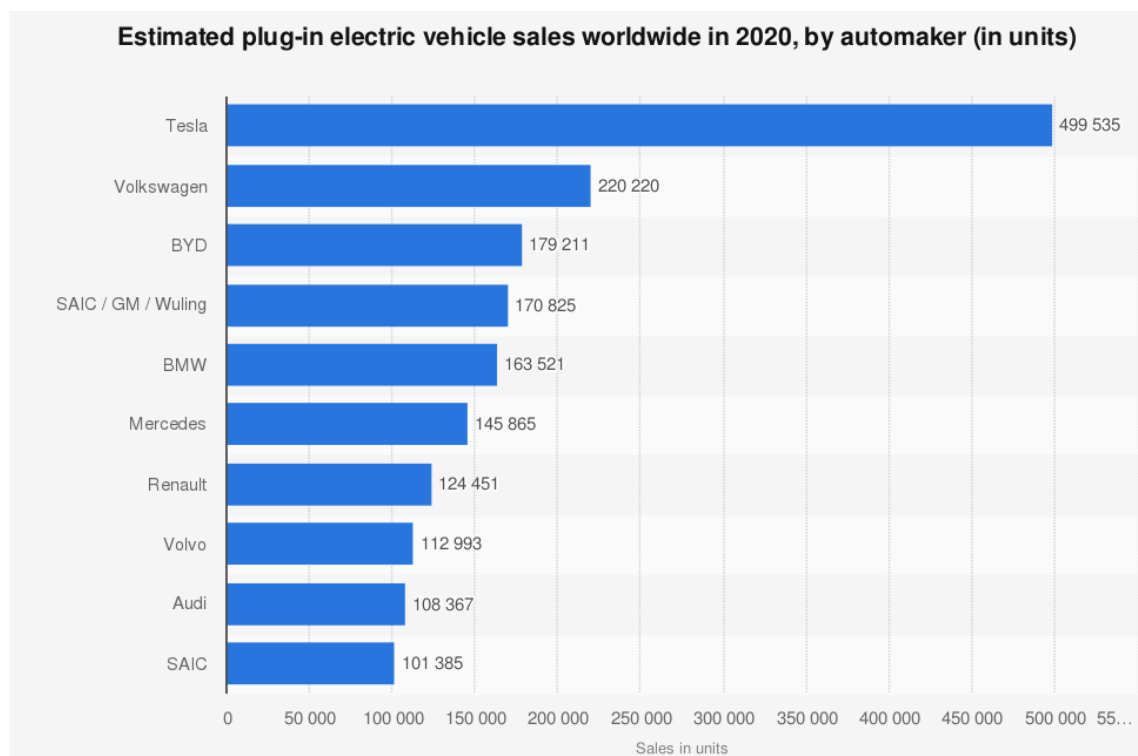
5.3 practical marketing recommendation:

Tesla, Inc. is a Palo Alto, California-based electric car, and renewable energy corporation. Tesla's latest offerings include hybrid vehicles, battery energy storage from the home to the grid, solar panels, and solar roof tiles, as well as other associated products and services. Tesla is the world's best-selling plug-in and hybrid electric passenger car maker, accounting for 16% of the plug-in category and 23% of the battery electric segment in 2020 sales. Tesla, through its subsidiary SolarCity, designs and builds solar photovoltaic systems in the United States. Tesla is also one of the world's leading manufacturers of battery energy storage devices, with 35% of the market.

Tesla Motors was founded in July 2003 as a tribute to inventor and electrical engineer Nikola Tesla. Elon Musk, who provided most of the initial funds, has served as CEO since 2008. Tesla's mission, according to Musk, is to help accelerate the transition to renewable transportation and electricity, which can be accessed by electric cars and solar power. In 2009, Tesla started manufacturing of their first car model, the Roadster. The Model S sedan debuted in 2012, the Model X SUV debuted in 2015, the Model 3 sedan debuted in

2017, and the Model Y crossover debuted in 2020. With over 800,000 units sold, the Model 3 is the world's best-selling plug-in electric vehicle in 2020.

Figure 4.1 E- vehicles sales in worldwide in 2020 (in units)



Source: statista,2020 <https://www.statista.com>

Tesla was the best-selling electric vehicles brand in 2020. The last year, tesla sold just under 5,00,000 plug-in electric vehicles globally. Second is Volkswagen sold 2,20,220 plug- in electric vehicles globally. And third placed BYD in the leading manufacturer of electric vehicles in china, BYD sold 1,79,211 plug- in electric vehicles globally in 2020.

5 CONCLUSION AND RECOMMENDATION

5.1 Conclusion

Every day, we come across a plethora of topics and articles stating the value of Vehicles and how governments all over the world are adopting measures to encourage Vehicles to minimize reliance on oil, eliminate greenhouse gasses, and increase air quality. The Indian automobile industry saw a 24.6 percent increase in commercial vehicle sales; these numbers are reason enough to roll up our sleeves and do something about it. Metropolitan areas are a big source of pollution, so it is important that people live in these cities understand and do their part to reduce the ingestion of life-threatening gasses and contaminants. Similarly, in this case, E-Vehicles had the potential to be game changers, but their disadvantage would be if people were unaware of them. This research seeks to gather thoughts, sentiments, and expectations about automotive visibility and desire to purchase vehicles to ensure environmental sustainability. In India, data is gathered from car owners. The report also explores consumer perception of government programs for E-transportation in India.

The responses for the questionnaire proved to be crucial for the conclusion of our research as the results were positive and were matching with what was predicted by us. The perception of people towards EVs is still unsatisfactory as a major section of our society is still unaware of various Alternative Technologies used in Automobiles. The current EVs don't meet the consumer's expectations to a larger extent.

The Government Initiatives taken for the promotion of EVs is still in developing stage and is up to papers, though various agencies have been formed and various plans have been brought by them but still its implementation is not yet done. The consumers will prefer EVs only if they are comparable with current Car on road, so a change in consumer's behavior is important. They should gradually become more conscious about the use of cleaner technologies.

Though many consumers will not prefer the current Electric/Hybrid Car but still there are lots of options available which is built to meet consumer 's expectations such as REVOLVO KIT. Marketing of such products will really play an important role as a stepping foot towards GREENER ENVIRONMENT. Various companies should take initiatives to promote electric Car as a part of their corporate social responsibilities. Finally, the future of the Electric/Hybrid Car is GREEN. The survey allowed the definition of key managerial implications for the implementation of a successful marketing strategy, which refers to new marketing strategies that can encourage customer interaction and boost purchases, such as AI-based chatbots and virtual assistants; scarcity and urgency marketing tactics; and a subscription-based marketing model. The small sample size caused by a lack of time and funding has a negative impact on the validity and reliability of survey results. Nonetheless, despite their shortcomings, the findings obtained allow for the identification of core concepts of a consumer-oriented marketing approach that places customer satisfaction and buying experience at the center of all business processes. Until implementing a campaign plan, an organization will gain insight into key customer desires and behavioral indicators by observing consumer behavior. Personalized value propositions and shopping experiences provide a solid foundation for consumer engagement and retention. Customer retention, loyalty, and participation can all be prioritized. All of which leads to the company's customer-focused business campaign becoming a primary strategic advantage.

5.2 Recommendations

Consumer behavior is very volatile and often vulnerable to outside stimuli. Marketing managers need to make sure that they devise business strategies and plans in a way they keep the consumer enticed to their brand. This research showed that among the seven elements of the marketing mix, promotions in the form of advertising and sales promotions techniques hardly had a bearing on the choice of the brand of coffee in both the countries.

However, it is truly evident that advertising and sales promotions cannot be completely done away with in this racing corporate world, where all the companies are vying for the wallet of the consumer. Yet, changes can be made to these strategies so that they appeal the consumers more and contribute towards the purchase of the product. Marketers can come up with different innovations in their sales promotions campaigns so that the consumers are lured to buy their coffee brand. The advertisements of the coffee across various media need to touch their heart and soul. Of course, after luring the customer into a one-time sale, the game does not end there.

The marketers need to make sure that the other elements of the marketing mix, which is the product itself, price, packaging, place, processes, and physical evidence need to be favorable for the consumer so that he becomes loyal to the brand and repeats his purchases. So, the game that started with promotions needs to be kept playing with the other elements of the marketing mix being favorable and appealing to the consumer. In the end if all the rules of the game are followed, the marketer is sure to win. However as much as it is necessary to be on the top of this game, marketers should never discontinue studying the consumer behavior of the target market, be it the Czech Republic or India as the consumer keeps on evolving because of so much information and social interaction around. This in turn affects his preferences and paradigms. For the marketers it is all about leveraging these new preferences and paradigms and serve coffee products in the market which satisfy the consumer and

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7 APPENDIXES

Que 1	What is your Gender? <input type="checkbox"/> Female <input type="checkbox"/> Male <input type="checkbox"/> Other
Que 2	How old are you? <input type="checkbox"/> 18-25 <input type="checkbox"/> 25-35 <input type="checkbox"/> 45-55 <input type="checkbox"/> 55-65 <input type="checkbox"/> 65+
Que 3	What is your current occupation? <input type="checkbox"/> Students <input type="checkbox"/> Employed part time. <input type="checkbox"/> Employed full time. <input type="checkbox"/> Housewife <input type="checkbox"/> Retired <input type="checkbox"/> Others
Que 4	What is your yearly Income? <input type="checkbox"/> 0 – 50,000 <input type="checkbox"/> 50,000 – 1,00,000 <input type="checkbox"/> 1,00,000 – 5,00,000 <input type="checkbox"/> 5,00,000 – 10,00,000 <input type="checkbox"/> 10,00,000+
Que 5	Do you think purchasing an electric car can raise your social status? <input type="checkbox"/> Strongly disagree. <input type="checkbox"/> Disagree <input type="checkbox"/> Neutral <input type="checkbox"/> Agree <input type="checkbox"/> Strongly agree

Que 6	<p>According to the following choice, which kind of electric car do you prefer?</p> <ul style="list-style-type: none"> <input type="checkbox"/> Friends/ Family <input type="checkbox"/> Brand representative (Celebrity) <input type="checkbox"/> Brochure <input type="checkbox"/> Car Shows <input type="checkbox"/> Car magazines <input type="checkbox"/> Make my own choice. <input type="checkbox"/> Seller <input type="checkbox"/> TV Advertisement <input type="checkbox"/> Social Media 																																									
Que 7	<p>If you buy an electric car so what is the usage of your electric car? (Shopping)</p> <ul style="list-style-type: none"> <input type="checkbox"/> Micro Car <input type="checkbox"/> Super mini/ Subcompact car <input type="checkbox"/> Small Family car / Compact car <input type="checkbox"/> Full size car/ Large car <input type="checkbox"/> Sport Car <input type="checkbox"/> Convertible <input type="checkbox"/> Off - roaders/ SUV <input type="checkbox"/> Others 																																									
Que8	<p>I</p> <table border="1" data-bbox="373 1294 1259 1843"> <thead> <tr> <th data-bbox="373 1294 539 1464"></th> <th data-bbox="539 1294 683 1464">Never</th> <th data-bbox="683 1294 826 1464">Less than once per week</th> <th data-bbox="826 1294 970 1464">One to twice per week</th> <th data-bbox="970 1294 1114 1464">Three to Four times per week</th> <th data-bbox="1114 1294 1259 1464">Nearly everyday</th> </tr> </thead> <tbody> <tr> <td data-bbox="373 1464 539 1509">Shopping</td> <td data-bbox="539 1464 683 1509"></td> <td data-bbox="683 1464 826 1509"></td> <td data-bbox="826 1464 970 1509"></td> <td data-bbox="970 1464 1114 1509"></td> <td data-bbox="1114 1464 1259 1509"></td> </tr> <tr> <td data-bbox="373 1509 539 1655">Pick up. family members</td> <td data-bbox="539 1509 683 1655"></td> <td data-bbox="683 1509 826 1655"></td> <td data-bbox="826 1509 970 1655"></td> <td data-bbox="970 1509 1114 1655"></td> <td data-bbox="1114 1509 1259 1655"></td> </tr> <tr> <td data-bbox="373 1655 539 1744">Social activities</td> <td data-bbox="539 1655 683 1744"></td> <td data-bbox="683 1655 826 1744"></td> <td data-bbox="826 1655 970 1744"></td> <td data-bbox="970 1655 1114 1744"></td> <td data-bbox="1114 1655 1259 1744"></td> </tr> <tr> <td data-bbox="373 1744 539 1789">Travelling</td> <td data-bbox="539 1744 683 1789"></td> <td data-bbox="683 1744 826 1789"></td> <td data-bbox="826 1744 970 1789"></td> <td data-bbox="970 1744 1114 1789"></td> <td data-bbox="1114 1744 1259 1789"></td> </tr> <tr> <td data-bbox="373 1789 539 1843">Works</td> <td data-bbox="539 1789 683 1843"></td> <td data-bbox="683 1789 826 1843"></td> <td data-bbox="826 1789 970 1843"></td> <td data-bbox="970 1789 1114 1843"></td> <td data-bbox="1114 1789 1259 1843"></td> </tr> </tbody> </table> <p data-bbox="373 1843 1259 1874">if you buy an electric car so what is the usage of your electric car?</p>							Never	Less than once per week	One to twice per week	Three to Four times per week	Nearly everyday	Shopping						Pick up. family members						Social activities						Travelling						Works					
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Works																																										

Que 9	Suppose you are going to buy an electric car for your private use among the following factors, which one matches you most?					
	Very Un Important	Not Important	Neutral	Important	Very Important	
Brand						
Price						
Safety						
Speed						
Performance						
Technology						
Charging Time						
Color						
Size						
Equipment and interior						
Exterior Design						
Interior Design						
Resale Value						
Que 10	<p>How much you want to spend on purchasing your electric car?</p> <p>0 – 5,00,000</p> <p>5,00,000 – 10,00,000</p> <p>10,00,000 – 15,00,000</p> <p>15,00,000 – 20,00,000</p> <p>20,00,000 – 25,00,000</p> <p>25,00,000 – 30,00,000</p> <p>30,00,000+</p>					
Que	What do you think before buying an electric car?					

Responses Survey Questioner link:

<https://forms.gle/zLP7JYUBkjWWf1B9>

